National Institute on Drug Abuse
National Institute on Alcohol Abuse and Alcoholism

THE ECONOMIC COSTS OF ALCOHOL AND DRUG ABUSE IN THE UNITED STATES 1992

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THE ECONOMIC COSTS OF ALCOHOL AND DRUG ABUSE IN THE UNITED STATES 1992

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1. EXECUTIVE SUMMARY

1.1 Overview

The economic cost to society from alcohol and drug abuse was an estimated $246 billion in 1992. Alcohol abuse and alcoholism cost an estimated $148 billion, while drug abuse and dependence cost an estimated $98 billion. When adjusted for inflation and population growth, the alcohol estimates for 1992 are very similar to cost estimates produced over the past 20 years, and the drug estimates demonstrate a steady and strong pattern of increase. The current estimates are significantly greater than the most recent detailed estimates developed for 1985 for alcohol and for drugs (Rice et al. 1990)—42 percent higher for alcohol and 50 percent greater for drugs over and above increases due to population growth and inflation. Between 1985 and 1992, inflation accounted for about 37.5 percent and population growth for 7.1 percent increases.

The National Institute on Drug Abuse (NIDA) and the National Institute on Alcohol Abuse and Alcoholism (NIAAA) asked The Lewin Group to develop more current estimates of the costs of drug and alcohol abuse. Several factors underscored the need for new estimates. First, prior complete estimates used detailed data from 1985. However, the intervening years have seen major changes in the nature of these problems (e.g., the cocaine and HIV epidemics) and in the organization and delivery of drug and alcohol treatment and general health services (e.g., the influence of managed care and other changes in Medicaid, Medicare, and private insurance). Second, there have been important advances in our knowledge about the nature and impact of alcohol and drug problems. This study has incorporated more current data.

According to recent studies, the prevalence of severe drug problems and their consequences has increased since 1985—notably from the epidemic of intensive/heavy cocaine use and from the increased spread of the HIV epidemic, both of which were in their early stages in 1985. However, most surveys indicate that there are fewer low-intensity drug users. The rates of alcohol consumption and associated problems declined throughout the 1980's—perhaps by as much as 10 percent between 1985 and 1992 (NIAAA 1993; Grant et al. 1994). However, treatment data suggest that since 1985, increasing proportions of persons treated for alcohol problems also have drug problems.

Changes in prevalence have been associated with a material increase in drug costs. Although crime rates did not change substantially during this period, criminal justice expenditures more than doubled overall—even after adjustment for price increases. This can be attributed mainly to increases in the number of persons incarcerated. This reflects a real and widely recognized phenomenon.

The balance of changes are due to new findings and/or methodology indicating larger effects than previously estimated. One substantive change in the methodology has resulted in material increases in cost estimates. This study includes higher proportions of various health problems as attributable to drug and alcohol abuse and dependence, basing this change on the current epidemiological literature. This issue is addressed in detail in chapter 4, which presents the rationale and data that justify the change in methodology and indicates the magnitude of the impact this change has had on the estimates.

Alcohol and drug abuse disorders carry with them a number of specific, well-recognized sequelae. Among them are the following:

- Health consequences and their effects on the health care system;
- Criminal behavior, either as a means of individual support, participation in the drug trade, or violence; and
- Job loss, financial destitution, and subsequent reliance on society's safety nets.

The aim of this study is to quantify the effects of alcohol and drug abuse disorders in dollar terms. This study reviewed research evidence, analyzed available data bases, and discussed findings with topical experts. Additional research into the causal role played by alcohol and drug abuse in the variety of social problems that occur in the United States will benefit future studies.

The main results of this study are summarized in table 1.1. Costs and primary findings are reviewed in the following sections.

1.2 Health Care Expenditures

In 1992, total estimated spending for health care services was $18.8 billion for alcohol problems and the medical consequences of alcohol consumption and $9.9 billion for drug problems. Specialized services for the treatment of alcohol and drug problems cost $5.6 billion and $4.4 billion, respectively. This included specialized detoxification and rehabilitation services as well as prevention, training, and research expenditures. Costs of treatment for health problems attributed to alcohol and drug abuse (e.g., cirrhosis, HIV infection, and trauma) were $13.2 billion and $5.5 billion, respectively.

These costs for the medical consequences of alcohol and drug abuse are significantly greater than estimates from the study by Rice et al. (1990), primarily because that study did not utilize mortality-based epidemiological data about the causal involvement of drug and alcohol problems in illnesses other than fetal alcohol syndrome and HIV infection. Thus, alcohol and drug abuse-related costs of most medical consequences were significantly underestimated. In addition, although the medical literature already contains a significant number of studies on the medical consequences of alcohol abuse, which are reviewed and summarized in the *Eighth Special Report to the U.S. Congress on Alcohol and Health* (NIAAA 1993), researchers for this report found it necessary to review and summarize findings for several medical consequences of drug abuse—including HIV, tuberculosis, and hepatitis B and C (see chapter 4).

Table 1.1

Economic Costs of Alcohol and Drug Abuse in the United States, 1992

(millions of dollars)

Economic Costs	Total	Alcohol	Drugs
Health Care Expenditures			
Alcohol and drug abuse services	$9,973	$5,573	$4,400
Medical consequences	$18,778	$13,247	$5,531
Total, Health Care Expenditures	***$28,751***	***$18,820***	***$9,931***
Productivity Effects (Lost Earnings)			
Premature death	$45,902	$31,327	$14,575
Impaired productivity	$82,201	$67,696	$14,205
Institutionalized populations	$2,990	$1,513	$1,477
Incarceration	$23,356	$5,449	$17,907
Crime careers	$19,198	—	$19,198
Victims of crime	$3,071	$1,012	$2,059
Total, Productivity Effects	***$176,418***	***$106,997***	***$69,421***
Other Effects on Society			
Crime	$24,282	$6,312	$17,970
Social welfare administration	$1,020	$683	$337
Motor vehicle crashes	$13,619	$13,619	—
Fire destruction	$1,590	$1,590	—
Total, Other Effects on Society	***$40,511***	***$22,204***	***$18,307***
TOTAL	**$245,680**	**$148,021**	**$97,659**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

1.3 Premature Death

More than 132,000 persons died as a consequence of alcohol and drug problems in 1992. Of these deaths, 107,400 were related to alcohol abuse and 25,500 were related to drug abuse. The estimated costs were $31.3 billion and $14.6 billion, respectively, representing the present discounted value of expected lifetime earnings (discounted at 6 percent). The average loss per death was almost $350,000 (however, the average loss per drug-related death was almost twice as high as for alcohol due to different average ages of decedents). The costs using a 3-percent discount rate are $45.7 billion and $21.3 billion, respectively. Many of the alcohol- and drug-related deaths were among persons between ages 20 and 40, because the major causes of death, such as motor vehicle crashes, other causes of traumatic death, and HIV infection, are concentrated among younger age cohorts. However, alcohol is also involved in numerous premature deaths among the older population because of long-term, excessive alcohol consumption. As far as premature deaths are concerned, this study found only modest differences from the study by Rice et al. (1990), except that the number of deaths associated with drug-related HIV increased dramatically from 1985 to 1992—a substantial increase in the cost of drug abuse.

1.4 Impaired Productivity

An estimated $82 billion in lost potential productivity was attributed to alcohol and drug abuse in 1992 ($67.7 billion and $14.2 billion, respectively). This accrued in the form of work not performed—including household tasks—and was measured in terms of lost earnings and household productivity. These costs were primarily borne by the drug or alcohol abusers and by those with whom they lived. About $1 billion was for victims of fetal alcohol syndrome who had survived to adulthood and experienced mental impairment. This study has not attempted to estimate the burden of drug and alcohol problems on work sites or employers, nor should the estimates in this study be interpreted in this manner.

Analysis of the recently available National Longitudinal Alcohol Epidemiologic Survey (NLAES) has provided new data on alcohol and drugs in the workforce. Among the working-age population, an estimated 4.6 million persons met the criteria for a diagnosis of drug dependence, and 24.5 million persons had a history of alcohol dependence in their lifetime (using clinical standards of severity). Because of overlaps (3.2 million persons with a prior history of both drug and alcohol dependence), the total number of impaired persons was 26 million. The most severe impact of alcohol abuse was experienced by males who had started drinking (more than just "sips") before their 15th birthday and had at some time met the criteria for dependence. People who started drinking after age 14 had much smaller negative effects on productivity.

1.5 Motor Vehicle Crashes

Total costs attributed to alcohol-related motor vehicle crashes were estimated to be $24.7 billion. This included $11.1 billion from premature mortality (counted/included above) and $13.6 billion from automobile and other property destruction. The costs for health care treatment for injuries are included under health care expenditures, previously discussed.

Although research suggests that drug abuse is involved with a small fraction of motor vehicle crashes, this literature is primarily anecdotal and very limited. The National Highway Traffic Safety Administration has begun to systematically acquire information about drug involvement in fatal crashes. However, this effort is still in its early stages, and drug-use information is not yet being routinely acquired in the same way as it is for alcohol.

1.6 Crime

Costs of crime attributed to illicit drug abuse were estimated at $59.1 billion, and costs of crime attributed to alcohol abuse were estimated at $19.7 billion. These costs include reduced earnings due to incarceration, crime careers, and criminal victimization; and the costs of criminal justice and drug interdiction. Costs of crime are itemized in table 1.2 and are an elaboration and reorganization of the costs in table 1.1. In addition to drug-defined and alcohol-defined crimes, such as drug trafficking and driving under the influence, the costs of crime also include the following:

- Drug abuse is estimated to have contributed to 25 to 30 percent of income-generating crime, and

- Alcohol abuse is estimated to have contributed to 25 to 30 percent of violent crime.

Somewhat different rates apply for different types of crimes and alcohol and drugs. In contrast, about 5 percent or less of income-generating crime is attributed to alcohol, and 5 percent or less of violent crime is attributed to drug abuse.

Expenditures within the criminal justice system totaled $23.6 billion ($17.4 for drugs and $6.2 billion for alcohol). Costs to victims were $11.8 billion ($3.8 billion for drugs and $8.0 billion for alcohol). Most of the estimated victim losses were for lost lifetime earnings of homicide victims, but this estimate also includes medical expenses, lost work, and damaged/destroyed property. In addition, victims lost $2.6 billion in stolen cash and property. A substantial loss of potential productivity to the economy was associated with incarceration of inmates for drug- and alcohol-related offenses (460,000 and 140,000 person years at a loss of potential productivity of $17.9 billion and $5.4 billion, respectively). Further losses of $19.2 billion are attributed to a full-time equivalent of 600,000 drug abusers and traffickers dropping out of the legitimate economy in order to earn income from predatory and/or consensual crime (e.g., drug trafficking, gambling, and prostitution).

1.7 Social Welfare

This study estimates that 3.3 percent of social welfare beneficiaries in 1992 received benefits *because of* an administrative determination of drug- or alcohol-related impairment. While subsequent welfare reform has largely terminated alcohol or drug dependence as a primary cause for benefit eligibility, these impairments resulted in transfers of $10.4 billion in 1992, with administrative and other direct service expenses of $683 million for those with alcohol problems and $337 million for those with drug problems. Although administrative and direct service costs are included in the costs to society, the value of income transfers is not included because they simply shift or transfer resources from one part of society (a loss to taxpayers) to another part of society (a gain to transfer payment recipients). Several studies have found that social welfare beneficiaries have only modestly higher rates of alcohol and drug problems than the general population; however, this does not appear to have been their primary reason for eligibility. While as many as 30 to 40 percent of beneficiaries do use illicit drugs and/or abuse alcohol, it would appear that for most of these individuals their use of alcohol and psychoactive drugs is not of such a severity as to have impaired their ability to gain employment.

Table 1.2

Total Costs of Alcohol and Drug Abuse for Specific and Related Crime, 1992

(millions of dollars)

Type of Cost	Total	Alcohol	Drugs
Criminal Justice Expenditures and Victim Health Care			
Economic Costs to Victims			
Medical expenses for victims of violent crimes	$505	$400	$105
Property damage	$221	$28	$193
Total, Economic Costs to Victims	***$726***	***$428***	***$298***
Criminal Justice System			
Police protection	$6,191	$1,547	$4,644
Legal and adjudication	$1,701	$491	$1,210
State and Federal correction	$8,483	$1,790	$6,693
Local correction	$3,517	$2,326	$1,191
Total, Criminal Justice System	***$19,892***	***$6,154***	***$13,738***
Federal Drug Traffic Control	**$3,753**	**$62**	**$3,691**
Subtotal, Public Expenditures	***$23,645***	***$6,216***	***$17,429***
Private Legal Defense	**$416**	**$68**	**$348**
SUBTOTAL	**$24,787**	**$6,712**	**$18,075**
Crime-Related Productivity Losses			
Homicide victims (premature death)	$8,016	$6,589	$1,427
Other victims of crime	$3,071	$1,012	$2,059
Incarcerated offenders	$23,356	$5,449	$17,907
Crime careers	$19,198	—	$19,198
SUBTOTAL	**$53,641**	**$13,050**	**$40,591**
TOTAL	**$78,428**	**$19,762**	**$58,666**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

1.8 Who Bears the Costs of Alcohol and Drug Abuse?

Much of the economic burden of alcohol and drug problems falls on the population that does not abuse alcohol and drugs (see table 1.3). For alcohol problems, governments bore costs of $57.2 billion (38.6 percent) in 1992, compared with $15.1 billion for private insurance, $9 billion for victims, and $66.8 billion for alcohol abusers and members of their households. For drug abuse, governments bore about $45.1 billion (46.2 percent) of the total of $97.7 billion; private insurance, $3.1 billion; victims, about $6.5 billion; and abusers and members of their households, $42.9 billion.

Costs are imposed on society (nonabusers) in a variety of ways. These include drug- and alcohol-related crimes and trauma (e.g., motor vehicle crashes); government services, such as criminal justice and highway safety; and various social insurance mechanisms, such as private and public health insurance, life insurance, tax payments, pensions, and social welfare insurance.

The costs primarily born by abusers include (1) lost legitimate earnings (and household productivity) related to impaired functioning in the labor market; (2) lost legitimate earnings related to incarceration; and (3) foregone legitimate earnings when drug abusers pursue income through illegitimate means, including predatory and consensual income-generating crime (e.g., theft, drug trafficking, and prostitution). Even these costs are shifted somewhat. Lost earnings translate into lost tax revenue (a shift to government), and income from theft accrues to the benefit of abusers—a loss for victims. It is more difficult to assess the incidence of burden from the drug economy, where abusers forego legitimate earnings for income from other sources. This is discussed briefly in chapter 7.

Table 1.3

Where the Burden of Alcohol and Drug Problems Falls, 1992

(billions of dollars)

	Alcohol	Drugs
Abusers and households	$66.8	$42.9
Government	$57.2	$45.1
Private insurance	$15.1	$3.1
Victim losses	$8.9	$6.5
TOTAL	**$148.0**	**$97.7**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

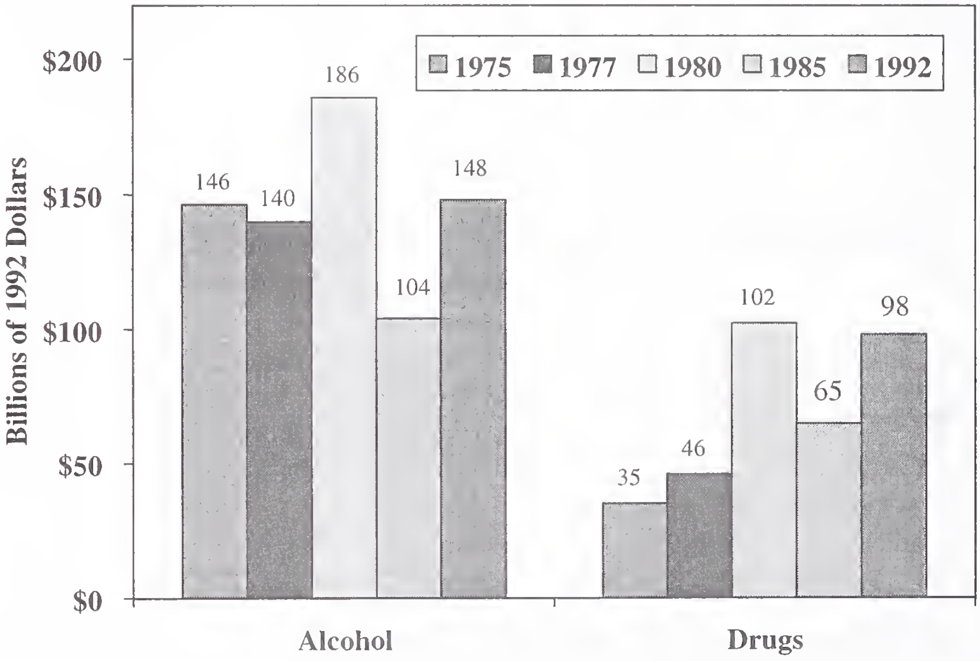
1.9 Comparison With Prior Studies

Estimates from this study are generally comparable to those produced by prior major studies on the economic impact of drug and alcohol abuse. Although literally hundreds of differences have occurred from study to study—and that is true in comparing this study with Rice et al. (1990)—it is fair to say that generally similar methodological approaches have been applied in most of the studies discussed below. This is true in terms of the nature of the effects included in the estimates and in terms of how values have been estimated.

Figure 1.1 compares results of the present study with the prior estimates, making adjustments for inflation and population growth during the 17 years that these estimates cover. Detailed comparisons are made with Rice et al. (1990), and more general comparisons with Rufener et al. (1977), Berry et al. (1977), Cruze et al. (1981), and Harwood et al. (1984). The current estimate for alcohol, $148.0 billion, is almost equal to the average of the four previous major studies and more than 40 percent greater than that of Rice et al. (1990). The drug abuse estimate of $97.7 billion is about 50 percent greater than that of Rice et al. (1990). There is a clear trend of increasing cost estimates for drug abuse across these studies when the productivity impact estimate of Harwood et al. (1984) is taken into consideration.

Figure 1.1

Comparison of Estimates From the Major Cost-of-Illness Studies for Alcohol and Drug Abuse, Adjusted for Inflation and Population Growth



SOURCES: 1975 alcohol: Berry et al. (1977); 1975 drugs: Rufener et al. (1977); 1977 drugs and alcohol: Cruze et al. (1981); 1980 drugs and alcohol: Harwood et al. (1984); 1985 drugs and alcohol: Rice et al. (1990); 1992 drugs and alcohol: analysis by The Lewin Group; price and population data: U.S. Bureau of the Census (1993).

NOTE: Bars in bar chart are arranged in order as cited in key.

Generally similar methodologies have been used to estimate the costs of alcohol abuse in each of the five studies. Each successive study incorporated the newest data and findings about the nature, extent, and impact of alcohol problems, yet these data did not produce fundamental changes in the estimates. The major cause of variation across the five studies is reduced productivity. Probably the most fundamentally different estimate was that of Rice et al. (1990), which yielded significantly lower estimates for health expenditures and reduced productivity than the other studies. Those topics receive intensive attention in this study, which documents and explains the nature of the differences in data, methods, and findings between this study and that of Rice et al. (1990) (see sections 4.2 and 5.3).

The five major drug abuse studies demonstrate a clear upward trend in cost estimates since 1975. This trend is generally attributable to the increasingly severe impact of drugs. Although some notable methodological differences exist between the first study (Rufener et al. 1977) and all the subsequent studies, there is evidence that most of the increase during the 17-year period is due to real changes in effects of drug abuse. Reasons for increased costs between 1977 and 1992 include emergence of the cocaine and HIV epidemics; an eightfold increase in State and Federal incarcerations for drug offenses (213,000 versus 28,000); and about a threefold increase in crimes that are attributed to drugs, such as burglary (100,000 versus 32,000). The prison census almost tripled between 1977 and 1992 (U.S. Department of Justice 1994g).

The most variable cost component across the five drug studies has been the impact of drug abuse on employment and earnings. Although this study estimates this impact to be 60 percent greater than that estimated by Rice et al. (1990)—$14.2 billion versus $8.7 billion—this is only one of several differences of this same magnitude that have contributed to the growth in costs.

1.10 Updated Estimates for 1995

Inflation and growth in the U.S. population have driven the economic effects of alcohol abuse and drug abuse higher since 1992 (see table 1.4). Based on these two effects, the estimated total costs of alcohol and drug abuse are projected to have increased 12.5 percent between 1992 and 1995. Accordingly, in 1995 alcohol abuse is estimated to have cost $166.5 billion and drug abuse is estimated to have cost $109.8 billion. These projections reflect adjustments for population growth (about 1 percent per year) and price changes (different rates for consumer and medical prices and for wage increases). However, no adjustment was made for potential changes in the incidence and prevalence of alcohol and drug problems during this period.

Table 1.4

Updated Cost Estimates: 1992 Estimates and Inflation- and Population-Adjusted Costs of Alcohol and Drug Abuse for 1995

(millions of current-year dollars)

	Alcohol		Drugs	
	1992	1995	1992	1995
Health Care Expenditures				
Specialty alcohol and drug services	$5,573	$6,660	$4,400	$5,258
Medical consequences	$13,247	$15,830	$5,531	$6,623
Productivity Impacts				
Lost earnings—premature death	$31,327	$34,921	$14,575	$16,247
Lost earnings—illness	$69,209	$77,150	$15,682	$17,481
Lost earnings—crime/victims	$6,461	$7,231	$39,164	$43,829
Other Impacts				
Crashes, fires, criminal justice, etc.	$22,204	$24,752	$18,307	$20,407
TOTAL	**$148,021**	**$166,543**	**$97,659**	**$109,832**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

2. INTRODUCTION

2.1 Purpose of This Report

Alcohol and drug abuse impose a variety of costs on our society. The aim of this study is to quantify the adverse outcomes of alcohol and drug abuse and express the magnitude of these consequences using the common metric of money. It is hoped that this information will contribute to a better understanding of the nature and magnitude of the impact of alcohol and drug abuse and that this understanding will help decisionmakers to identify appropriate strategies to reduce these adverse effects.

Economic analyses of alcohol and drug abuse disorders provide a convenient means of quantifying the effects of alcohol and drug abuse, effectively stating these impacts in “dollars.” It is abundantly clear, however, that there are effects of alcohol and drug abuse for which no economic analysis method or data base has yet been developed, and so this economic analysis cannot be complete.

The work represented in this report builds on a strong history of cost-of-illness studies conducted for more than 40 years. This report relies on the methods adopted by the U.S. Public Health Service, which were implemented in previous cost-of-illness studies of alcohol and drug abuse and mental health (Cruze et al. 1981; Harwood et al. 1984; Rice et al. 1990).

This report estimates the economic impact of alcohol and drug abuse for 1992. The year 1992 was selected as the most recent for which a wide variety of data were available at the time this study was undertaken. The most recent estimation by Rice and her colleagues was reported for 1990, but it relied mainly on inflation-adjusted data collected from 1985 (Rice 1993). Important changes in the organization and nature of health services, employment, and crime have taken place during the period between the last cost-of-illness study and 1992, necessitating a reexamination of costs with more up-to-date data. Section 2.2 describes the extent of the alcohol and drug abuse problems in 1992 and provides more background on the history and role of cost-of-illness studies.

This report is designed to serve as a tool for policy analysts and researchers with questions about the consequences and costs associated with alcohol and drug abuse. However, caution is urged that the data included in this report not be overinterpreted. For example, it is essential to point out that “high costs” do not necessarily translate into high marginal benefit from public policy changes. The data contained in this report are not an evaluation of the efficacy or impact of interventions; rather, these data may serve as a baseline to be used to understand or interpret potential changes.

2.2 Background

2.2.1 Alcohol and Drug Abuse and Dependence in 1992

The use of alcohol, tobacco, and illicit drugs, such as cocaine and heroin, account for many preventable health conditions and other problems common in the United States. However, alcohol or drug *use* does not equate to alcohol or drug *abuse.* In fact, alcohol and drug use ranges in severity from casual use to moderate use, alcohol and drug abuse, and alcohol and drug dependence—each potentially manifesting different types of consequences. The American Psychiatric Association (1994) has provided the following definitions of abuse and dependence:

- Alcohol or drug **abuse** is a maladaptive pattern of alcohol or drug use manifested by recurrent and significant adverse consequences related to the repeated use of alcohol or drugs.

- Alcohol or drug **dependence** involves a cluster of cognitive, behavioral, and physiological symptoms that result from repeated self-administration that usually results in tolerance, withdrawal, and compulsive drug-taking behavior.

Based on a household survey of 42,862 adults conducted in 1992, the National Longitudinal Alcohol Epidemiologic Survey (NLAES) (Grant and Dawson 1996) provides nationally representative estimates of alcohol and drug abuse as well as dependence. Based on use patterns and symptoms in the past year (1992), NLAES data indicate the following:

- 7.4 percent of the U.S. adult population—more than one-half of the Nation's heavy drinkers—were dependent on (4.4 percent) or abusers of (3.0 percent) alcohol, and

- 1.5 percent of the U.S. adult population (about 30 percent of the Nation's drug users) were dependent on (0.5 percent) or abusers (1 percent) of drugs.

Analyses of NLAES have also concluded that the younger the age of onset of drinking, the greater the chance that a person will develop a clinically defined alcohol disorder (National Institute on Alcohol Abuse and Alcoholism 1998). Youth who began drinking before they turned 15 were twice as likely to develop an alcohol abuse problem and four times more likely to develop alcohol dependence, compared with persons who did not begin drinking before age 21. More than 40 percent of respondents who began drinking before age 15 were classified as alcohol dependent at some time in their lives.

National statistics on the prevalence of alcohol and drug abuse only echo the personal experience of family members, friends, employers, and others who daily come into contact with alcohol- and drug-dependent persons. It is important to remember that many alcohol and drug users, even regular users, may continue for extended periods of time to lead functional, relatively balanced, and productive lives.

2.2.2 Trends in Alcohol and Drug Use Before and Since 1992

Even limited consumption of mind-altering substances may result in drastic consequences: Motor vehicle crashes that occur when intoxicated persons drive and overdoses of drugs or alcohol are a few examples. Though some types of economic impact may only result from long-term heavy consumption that is frequently associated with dependence (e.g., the costs of treating liver cirrhosis), any abuse of alcohol or drugs has the potential to impose costs on society.

Analysis of the 1992 National Household Survey on Drug Abuse (NHSDA) (Substance Abuse and Mental Health Services Administration 1995) indicates that in 1992 more than 1 in 10 civilians, noninstitutionalized U.S. residents over the age of 12 used illicit drugs, and about two-thirds of this same population drank alcohol. It is estimated that there were 47.8 million current drinkers (defined as those who drank within the past month) and 11.4 million current illicit drug users. Additional alcohol and drug use is found among noncivilians, institutionalized persons (e.g., prisoners), and children younger than 12.

During 1992, NHSDA data indicate that approximately 133 million persons drank alcohol and 22.9 million persons consumed illicit drugs during the previous year. Marijuana and hashish, the most commonly used illicit drugs, were used by 17.4 million persons in 1992. Psychotherapeutic drugs, such as stimulants, sedatives, tranquilizers, and analgesics, were used for nonmedical reasons by 7.8 million persons; cocaine in all forms, including crack, was used by almost 5 million persons. Inhalants and hallucinogens were used by 2.0 and 2.4 million persons, respectively. Although the design of the NHSDA may underestimate alcohol and drug abuse among certain populations, data suggest that more than 800,000 persons used cocaine and more than 320,000 persons used heroin—both of which receive considerable media attention.

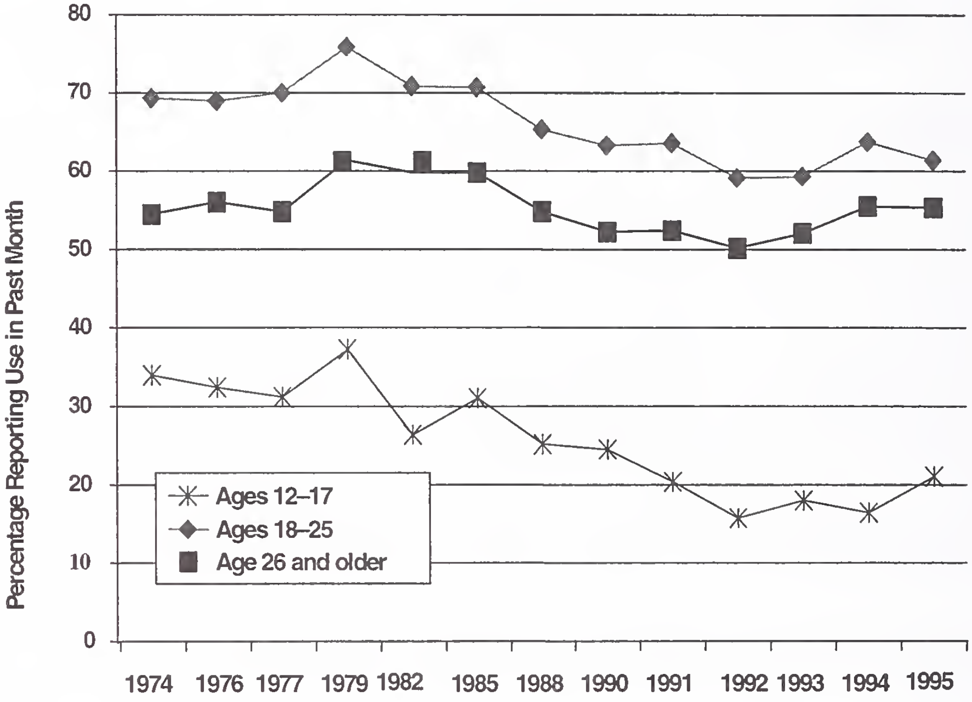
Estimates of alcohol and drug use for 1992 show a continuing decline that began during the late 1970's or early 1980's (see figures 2.1 and 2.2). Data from the NHDSA show declines in "current" alcohol and drug use (measured as consumption in the prior month) until 1992, including the following:

- A drop in alcohol use from 76 percent in 1979 to 59 percent in 1992 among 18- to 25-year-olds and from 61 percent in 1979 to 50 percent in 1992 among adults over age 25;
- A drop in marijuana and hashish use from 35 percent in 1979 to 11 percent in 1992 among 18- to 25-year-olds and from more than 6 percent in 1982 to 3 percent in 1992 among adults over age 25; and
- A drop in cocaine use (including crack cocaine) from 9 percent in 1979 to under 2 percent in 1992 among 18- to 25-year-olds, and from 2 percent in 1985 to 0.5 percent in 1992 among adults over age 25.

However, alcohol and drug use has increased modestly since 1992. Particularly troubling are dramatic increases in drinking and illicit drug use—including use of marijuana, cocaine, and inhalants—among the Nation's 12- to 17-year-olds. Nearly twice as many adolescents took drugs in the month before being interviewed in 1995 than was the case 2 years before. Heroin use among young adults increased before 1992, rising from 0.3 percent among 18- to 25-year-olds in 1988 to 1.3 percent in 1992.

Figure 2.1

Estimated Prevalence of Alcohol Use in the Past Month, 1974–1995

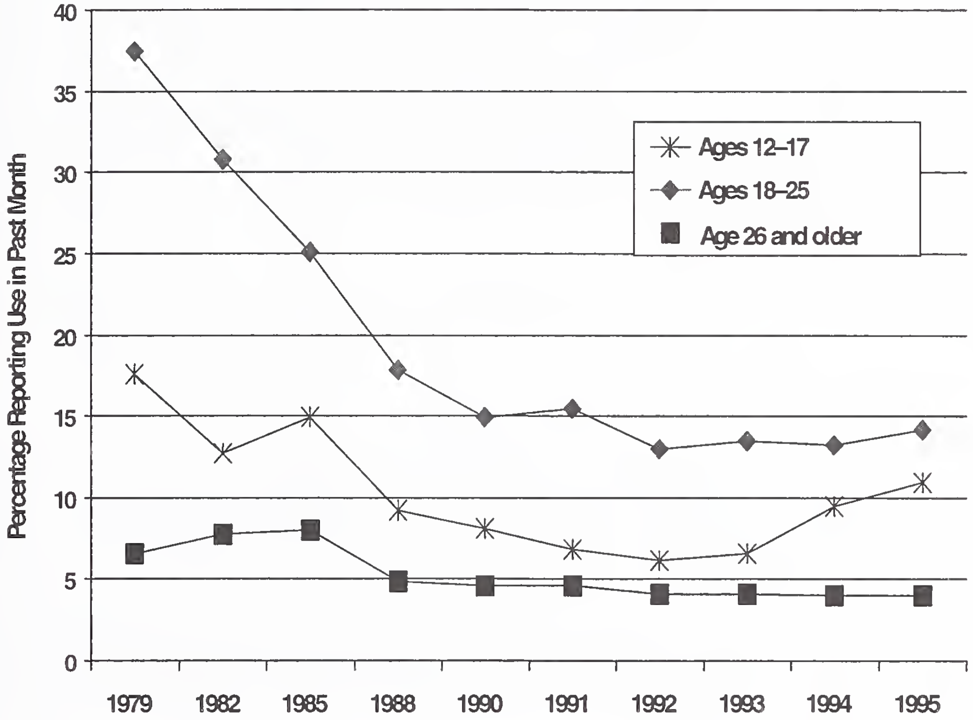


SOURCE: Substance Abuse and Mental Health Services Administration. Office of Applied Studies. National Household Survey on Drug Abuse: Main Findings and Population Estimates (multiple years, 1992–1996).

Illicit drug use was more common among males, residents of large metropolitan areas, college students, and unemployed persons than among other demographic groups in 1992. Males were about 1.5 times as likely to have used illicit drugs in the past year as females (13.4 percent versus 9.0 percent). About 12.1 percent of residents in large metropolitan areas used illicit drugs in the past year, compared with 10.4 and 10.3 percent of residents in smaller metropolitan and nonmetropolitan areas. About 13.7 percent of persons who went to college but did not graduate used illicit drugs in the previous year (compared with 9.8 percent of high school noncompleters, 11.5 percent of high school graduates, and 8.9 percent of college graduates). Finally, and most significantly, 24.0 percent of unemployed persons (excluding 12- to 17-year-olds) consumed illicit drugs versus 12 to 14 percent of employed persons and 5.8 percent of persons not in the labor force.[1]

Figure 2.2

Estimated Prevalence of Any Illicit Drug Use in the Past Month
1974–1995



SOURCE: Substance Abuse and Mental Health Services Administration. Office of Applied Studies. National Household Survey on Drug Abuse: Main Findings and Population Estimates (multiple years, 1992–1996).

NOTE: Estimates with low precision or years with no estimates reported are excluded.

In contrast to data from the NHSDA, which are more likely to capture casual use, data from the Drug Abuse Warning Network (DAWN) reflect more intense use. Although casual use has declined dramatically since the late 1970's, indicators of intensive use have significantly increased since that time. According to 1993 DAWN data, an estimated 466,900 drug abuse-related emergency room episodes occurred in the United States. This is a 16-percent increase from 403,600 in 1988 (U.S. Department of Health and Human Services 1994*c*). The rate of drug-related episodes per 100,000 persons age 6 and older increased from 186 in 1988 to 204 in 1993.

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[1] "Not in the labor force" is not the same thing as "unemployed." "Unemployed" is an appropriate term for a person who considers himself or herself to be looking for work but not currently employed. "Not in the labor force" is an appropriate term for a person who is neither employed nor looking for employment.

2.2.3 The Need To Reestimate Costs

Numerous studies of the economic impact of alcohol and drug abuse problems have been reported on over the past 30 years. Three comprehensive studies were completed within the past 15 years, including two studies conducted by Research Triangle Institute (Cruze et al. 1981; Harwood et al. 1984) and one by the Institute for Health and Aging, University of California, San Francisco (Rice et al. 1990). The Rice et al. study (1990), the most recent estimate available, reported economic costs based on 1985 data. Rice et al. (1990) found that alcohol and drugs together cost the United States more than $114 billion in 1985, more than one-half of which was due to lost productivity resulting either from premature mortality or from other factors associated with alcohol and drug abuse. Rice (1993) projected the 1985 alcohol estimates forward to 1990, primarily adjusting for inflation but relying on the same data collected during 1985. Similar summary projections of the drug abuse estimates to 1990 were reported in a Robert Wood Johnson Foundation report (Institute for Health Policy 1993).

Important changes have taken place in the past decade, underscoring the need to reestimate the costs of alcohol and drug abuse using up-to-date information. Among these changes are the following:

- Changes in the prevalence of alcohol and drug use disorders;
- Rapid spread of HIV and its primary sequela, AIDS, among intravenous drug users;
- Increased availability of cocaine and crack cocaine;
- Increases in crime and violent crime, which are possibly related to the drug trade;
- Passage of stricter drunk driving laws; and
- Increased availability of, and support for, alcohol and drug abuse treatment (largely during the late 1980's).

Alcohol and drug use disorders carry with them several wide-ranging and well-recognized sequelae, including the following:

- Health outcomes of alcohol and drug abuse problems and their subsequent impact on the health care system;

- Job loss, financial destitution, and reliance on society's safety nets; and
- Criminal behavior, including income-generating crimes, participation in the drug trade, and violence.

This report relies on an extensive array of data sources, including secondary analyses of nationally representative data bases, where available; literature reviews; and contacts with topical experts. Different topical areas are more or less "data rich." In particular, estimating the causal roles played by alcohol and drug abuse presents a challenge to the analyst. This report generally aimed to remain "conservative" when reaching conclusions, especially for cases where some amount of judgment was required; however, in some instances, less conservative estimates were supported by the research. For example, if a range of estimates of causality were available, researchers for this study picked a midrange value if it was defensible, but in some cases, they chose a value at the low end of the range. With this or any large study that presents the research evidence available at a moment in time, it is possible that newer research findings eventually may supplant some evidence reported. One important finding of this report, in fact, is that much more data and analyses of the specific roles played by alcohol and drug abuse in a variety of related problem areas are needed.

2.3 Scope of This Study

This study estimates the economic value of many consequences associated with the abuse of alcohol, illicit drugs, and other drugs taken for nonmedical purposes. Types of consequences include health problems and health care utilization, effects on productivity, and other costs, including crime and social welfare. This study did not collect primary data, but rather conducted analyses of secondary data sources. A thorough discussion of analytic principles used in estimating the cost of alcohol and drug abuse is provided in chapter 3. In general, this report identifies and estimates the economic value of adverse outcomes stemming from the misuse, abuse, and dependence on alcohol and drugs. Moreover, this report relies primarily on estimates of the value of goods and services and lost productivity stemming from alcohol and drug problems. Other effects or costs that one might expect to occur as a result of alcohol and drug abuse (e.g., pain and suffering) are not estimated here chiefly because of the lack of reliable and complete data.

Certain analyses of the economic costs of alcohol and drug abuse are included here, while other analyses might be undertaken at a later date. This study estimates the relative burden borne by government, employers, families, and others. It is infeasible in this comprehensive study, however, to fully consider the effects of the following on any or all of the consequences of alcohol and drug abuse:

- The roles of particular illegal drugs (e.g., heroin, cocaine, and marijuana) and particular categories of alcoholic beverages (e.g., beer, wine, and distilled spirits) separately or in combination with other substances;

- The effects of different modes of drug consumption (e.g., injection, smoking/inhalation, and oral); or

- The implications of different potencies for any of the substances under consideration.

There may be reasons to undertake a cost study of a particular substance, mode of consumption, or potency of substance. Public policy may be informed by such analyses. For example, such analyses could help to inform debates regarding (1) legal sanctions against drugs such as marijuana, powder cocaine, or crack cocaine; (2) taxation on smokable versus oral tobacco products; and (3) differential regulation of beer, wine, and distilled spirits. In theory, such analyses should be possible, although it may be difficult in practice because of data limitations.

Because many alcohol or drug abusers use multiple psychoactive substances (particularly illicit substances), developing estimates of the costs of particular substances can be difficult. Good epidemiological and etiological research should attempt to address this issue. However, the drugs and their patterns of use change continuously and rapidly, making it difficult to define and study consequences and costs associated with single substances.

Extensions of the analysis reported here could focus on particular patterns or situations of use. Two examples of this are the hypotheses that (1) consumption of high levels of alcohol poses greater risks when it occurs outside rather than inside the home, and (2) injection of drugs presents different risks than smoking and inhalation.

Future cost-of-illness studies might also consider the health benefits (primarily cardiovascular) associated with moderate consumption of alcoholic beverages. Those health benefits are acknowledged but not addressed in this report. This is indeed an important avenue for future research, and it does add a new dimension to our understanding of the economic impact of alcohol consumption in our Nation. However, this study estimates only the negative impact of drug and alcohol abuse and dependence. Its intent has not been to compare the negative effects with the benefits of alcoholic beverages (or psychoactive drugs). While a cost-of-illness study chronicles the damage of improper use and behaviors—which society properly strives to reduce—it does not constitute a summary judgment of the social or economic value of psychoactive alcohol and drugs in society.

The contributions of the alcoholic beverage industry to the U.S. economy are substantial, and alcoholic beverages are consumed safely by most consumers. In addition, there is credible evidence that moderate consumption of alcoholic beverages may have a positive impact on cardiovascular health. The nearly $75 billion that consumer surveys estimate is spent on alcoholic beverages per year (U.S. Department of Commerce 1993) is a meaningful part of the benefits perceived by consumers from consumption of these products. However, it is not correct—in fact, it is meaningless—to compare expenditures with negative economic effects and make summary judgments about how society should view and address alcoholic beverages. The proper level of analysis would be to examine specific public policies regarding alcohol consumption and to analyze their benefits and costs. This study yields data that could be useful in designing and performing such analyses, but it produces few insights into the justification for particular alcohol control policies.

Similarly, the results of this study yield few insights into specific policies to control drug abuse or into the alternatives of drug prohibition versus legalization. The purpose of this study has been to identify and quantify particular negative consequences from the abuse of and dependence on alcohol and illicit drugs. Such data may—and indeed should—inform the evaluation of particular policies. However, this study has not attempted such an undertaking.

2.4 Overview of the Report

Following the guidance for cost-of-illness studies adopted by the U.S. Public Health Service (Hodgson and Meiners 1979, 1982), this report is organized to differentiate health costs from non-health costs and the value of goods and services from the value of lost productive potential. The remaining chapters of this report are organized as follows:

- Chapter 3 describes the analytic principles underlying cost-of-illness studies such as this, including the history of these studies in alcohol and drug abuse. The chapter also describes the framework for estimating the consequences, causal role, and associated costs of alcohol and drug abuse.

- Chapter 4 discusses the health costs directly attributed to alcohol and drug abuse, including specialty alcohol and drug abuse treatment, and treatment for health conditions caused by alcohol or drug abuse.

- Chapter 5 presents the estimates of productivity losses due to alcohol and drug abuse associated with premature deaths; foregone productivity in the workplace and the home; and lost productivity due to institutionalization, incarceration, victimization, and participation in criminal enterprises.

- Chapter 6 presents the costs of crime and criminal justice system expenditures, the costs of motor vehicle crashes, and social welfare costs that result from alcohol and drug abuse, as well as lost legitimate earnings among people in society who are affected by, but not necessarily directly engaged in, alcohol or drug abuse.

- Chapter 7 concludes this study by answering the questions, "Who bears the costs of alcohol and drug abuse?" and "How do the results of this study compare to previous estimates of alcohol and drug abuse costs?" Additional priorities for research are also identified in chapter 7. Supporting materials and detailed tables are included in the appendixes.

This report is organized into discrete sections within each chapter so that the reader does not have to read the entire report in order to understand a particular issue or topic of interest. For example, a discussion of the cost of fetal alcohol syndrome in 1992 is fully contained in chapter 4, section 4.4.1. Each section discusses the prevalence or the magnitude of problems potentially related to alcohol and drug abuse, estimates of the amount of the problems caused by alcohol and drug abuse, and estimates of the costs associated with the problem. Some of the consequences of alcohol and drug abuse, however, result in health care, productivity, and other costs. Such is the case with alcohol-related motor vehicle crashes or alcohol- and drug-related crime, which contribute to costs reported in chapters 4, 5, and 6.

3. ANALYTICAL PRINCIPLES IN ESTIMATING THE COSTS OF ALCOHOL AND DRUG ABUSE

This study of the cost-of-illness (COI) of alcohol and drug abuse relies on and in some cases further develops the analytical principles and methods employed in previous estimates of the alcohol and drug abuse COI.[1] This chapter reviews these analytical principles and describes the general approach used in this analysis. *In this, as in other COI studies, the objective is to increase the understanding of the nature and extent of illness and its consequences for society.* The data and discussion included in this report could assist analysts and decisionmakers in identifying the variety and extent of the economic effects associated with alcohol and drug abuse; this in turn can help in assigning appropriate priorities to specific interventions.

3.1 Synopsis

This section identifies the questions that need to be addressed in the design and performance of an alcohol and drug abuse COI study and indicates the general approach to developing the necessary answers. Essentially, a COI study must answer the following three questions:

- What adverse **outcomes** are associated with alcohol and drug abuse?
- What is the degree of **causality** between alcohol and drug abuse and these outcomes?
- What **economic values** ought to be assigned to the consequences?

Studies of the economic impact of alcohol and drug abuse typically focus on health care costs, effects on productivity and earnings (as a result of illness and premature death), and other costs (such as crime and social welfare). Although better data are available now than was the case in prior studies, determining how much alcohol and drug abuse contribute to specific adverse outcomes is still considerably limited by a lack of empirical evidence. A major effort in this study is to review evidence that is available. Assigning economic values is relatively straightforward, although, again, further research into the sensitivity and specificity of the economic values is warranted.

This study builds on a strong history of prior studies of alcohol and drug abuse and other illnesses and follows guidelines established 20 years ago for the conduct of these studies. A review of the COI literature reveals several strong conclusions. First, most COI studies build on almost 40 years of experience conducting COI studies in health, generally using an opportunity cost framework. Most recent studies have a common understanding of the concepts at the foundation of such efforts. Second, the specifics of how the studies have been performed differ only somewhat in the details. Most of the differences among studies are attributable to differences in the data that have been available for use in constructing the estimates. The specific methodology used or approach taken in developing a component of a COI estimate is often dictated by the data available to the analyst. Finally, COI studies do not provide sufficient justification for any particular social initiatives directed at alcohol and drug abuse. COI estimates do provide insights to help answer questions such as the following:

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[1] Original versions of some of the material discussed in this chapter were prepared for the Canadian Centre on Substance Abuse.

- What types of health care services—and in what amounts—are required to treat alcohol and drug abuse and related health consequences? How much do these services cost?
- How many people die as a result of alcohol and drug abuse, and what is the economic impact of these premature deaths?
- What effects do alcohol and drug abuse have on individual productivity in the home and workplace?
- How much crime is due to alcohol and drug abuse, either by definition (e.g., drug trafficking), requirements for money (e.g., robbery), or physiologic effects (e.g., assaults)? What does it cost to protect against these crimes, adjudicate arrests, and punish offenders?
- How much reliance on the social welfare system is caused by alcohol and drug abuse, and at what cost?
- What are the economic dimensions of other effects of alcohol and drug abuse, such as motor vehicle crashes and fire destruction?

The reader should be aware that no single source of information encompasses the variety of costs included in this report. Hundreds of sources of information were compiled and analyzed to guide the selection of appropriate causal factors and economic values. This approach was adopted to provide a broad basis for the estimates even though it also necessarily involves a degree of imprecision. As a result, this study presents *estimates* rather than precise measures of the economic costs of alcohol and drug abuse. In addition, this approach renders it impossible in a number of instances to obtain some of the usual statistical indicators by which estimates are evaluated (e.g., standard errors). Nevertheless, the estimates reported here are based upon the most accurate and up-to-date information available at the time that this study was conducted.

The next sections discuss the history of alcohol and drug abuse COI studies and draw from them the framework that has been applied in this study. This is followed by a summary of data sources and their strengths and limitations and, finally, by a discussion of how the burden of the costs of alcohol and drug abuse is distributed.

3.2 A Short History of Cost-of-Illness Studies

COI studies in general, and those for alcohol and drug abuse in particular, are not newly invented, and the general approach to such studies is well established. In fact, this study, as well as the past several studies, has followed guidelines created by the U.S. Public Health Service expressly to help standardize the methods used in assessments of the costs of many types of illness.

3.2.1 Prior Studies on Alcohol and Drug Abuse

COI studies on alcohol and drug abuse have been conducted for almost 25 years and have built on an additional 15 years or more of COI studies on various health problems. There has been a steady evolution of this literature in the United States, along both theoretical lines and, especially, methodological lines. As the methodology has advanced, there has been greater consistency and comparability across studies (as well as a demand for the same). The general approach to these studies could now be considered nearly standardized, based on the application of well-understood principles of economic valuation.

All of the studies of alcohol and drug abuse were preceded by COI studies of other types of illnesses and problems. These prior efforts include a study in Great Britain of road crashes (Reynolds 1956), a study in the United States estimating the costs for each of the internationally recognized major classes of illnesses (Rice 1966), and a U.S. study of mental illness (Fein 1958). Studies prior to these examined various components of what have come to constitute COI studies.

Perhaps the earliest study focusing on the economic costs of alcohol abuse was conducted for Australia in 1969–70 (Pritchard 1971). In the United States, the earliest COI studies date from 1973, including Berry and Boland's (1973) study of alcohol abuse and A.D. Little Inc.'s (1973) study of drug abuse. Since that time, a modest number of studies on the economic costs of alcohol abuse and alcoholism were conducted in other nations. Virtually all of the earlier studies of the abuse of drugs have been conducted in the United States. However, the most recent and comprehensive alcohol and drug abuse COI studies have been conducted in Australia (Collins and Lapsley 1991, 1996), the United States (Rice et al. 1990), and Canada (Single et al. 1996).

The alcohol and drug abuse COI studies performed since 1970 have had the explicit objective of demonstrating that a nontrivial amount of expenditures on health (and morbidity and mortality) are due to alcohol and drug abuse, either directly or indirectly. It should be noted that the study by Fein (1958) did identify and estimate certain "mental health" costs that were attributed to alcoholism and drug addiction and acknowledged certain other nonmedical costs (e.g., criminal justice system costs) that were not estimated because of time limitations.

Underlying the previous studies of alcohol and drug abuse, COI is the premise that an illness results in "costs" when resources are redirected as a result of that illness from purposes to which they otherwise would have been devoted. The next section discusses this point in depth.

3.2.2 The Guidelines and the Opportunity Cost Principle

Costs to society occur when resources are directed away from uses to which they would have otherwise been put or when the total amount of goods and services available to be consumed is reduced.

A central concept in market economics is "opportunity cost," and the studies reviewed employ this basic concept of cost. Opportunity cost is the dollar value of resources that are redirected away from uses to which they would have otherwise been put.

The opportunity cost concept in health studies has been refined throughout numerous studies performed since the 1950's. It achieved its broadest level of application in the United States in a series of COI studies associated with Dorothy Rice. The general approach to this cost methodology in the United States was codified by a task force of the U.S. Public Health Service (PHS) chaired by Dorothy Rice (see Hodgson and Meiners [1979, 1982] for the Guidelines report and a second article that elaborates on the Guidelines). The task force was convened in 1978–79 for the purpose of developing guidelines for COI studies performed or funded by the U.S. PHS. The Guidelines were intended to reduce methodological differences between COI studies performed for different illnesses or for studies of the same illnesses performed by different research teams. It is important to note that the Guidelines did not explicitly contemplate or address the conceptual or methodological challenges involved in constructing COI estimates for alcohol and drug abuse. The principles are general in nature, however, and certainly have been found to be applicable to the alcohol and drug abuse COI studies performed since the Guidelines were developed.

The U.S. PHS Guidelines did not actually set standards of practice or break new theoretical or methodological ground. Instead, the Guidelines recognized and described the mainstream of COI practice (as it developed internationally), noted its strengths and weaknesses, and acknowledged the orthodoxy of this approach. Most alcohol and drug abuse COI studies developed in the United States since the Guidelines were published have been generally based on its approach.

The approach endorsed in the U.S. PHS Guidelines accordingly does not address the conceptual issues associated with any enjoyment or benefit that consumers derive from the use of psychoactive substances. Nor does this approach deal with the fact that resources used to address the problems of psychoactive substances are creating new jobs—actually different jobs, since the funds are taken away from other uses that could themselves create jobs. Also, the theoretical economic constructs of "consumers' surplus," marginal utility analysis, and social welfare functions are beyond the scope of this analysis.

There are, of course, other types of economic studies that include components of the costs of alcohol and drug abuse—for example, the costs and/or benefits of particular types of interventions. These additional types of economic evaluations are described in the next section.

3.3 The Framework for Cost-of-Illness Studies

The construction of COI estimates for alcohol and drug abuse can be enormously challenging and complex; however, the framework for the study is relatively clear and easy to understand. The design and performance of these studies need to be built around a set of objectives and standards that have scientific validity and can be communicated to the concerned scientific community, policymakers, the media, and the general population. As noted above, this can be accomplished with the following three-step process:

- Identify the adverse outcomes associated with alcohol and drug abuse;
- Document and quantify the degree of causality between alcohol and drug abuse and the associated adverse outcomes; and
- Assign economic values to the adverse outcomes of alcohol and drug abuse.

Although accomplishing these steps can require significant time, resources, and skill, keeping these objectives and questions in mind during the course of the study should facilitate the effort and ultimately make the final product more accessible. The following sections discuss each of these steps in turn.

3.3.1 Adverse Outcomes Associated With Alcohol and Drug Abuse

The initial step in designing an alcohol and drug abuse COI study is to identify the tangible negative outcomes that are believed to result from alcohol or drug abuse in the area under study. Identification and definition of these outcomes provide a framework for the analysis. This makes it immediately possible to segment the work and to organize multiple and parallel research efforts.

Prior studies based on the PHS Guidelines differentiated “direct” from “indirect” and “core” from “noncore” costs. Direct costs refer to the value of tangible goods and services actually delivered to address consequences of the illness. Indirect costs represent the value of personal productive services that are not performed because of the consequences of the illness. Core costs refer to health care costs and other health-related consequences, and noncore costs refer to costs not manifested through the health consequences of the illness. For example, alcohol and drug abuse treatment were “core, direct” costs. Foregone earnings due to premature death from a drug overdose were a “core, indirect” cost.

This study replaces the terminology used in previous studies but preserves the distinctions between health and nonhealth costs and between out-of-pocket versus foregone earnings. The following are major categories of “consequences,” represented in this report as separate chapters:

- **Health care costs.** These include the costs of treating alcohol and drug abuse as well as illnesses or injuries brought on by alcohol or drug abuse.
- **Productivity losses.** These include foregone earnings during 1992 among alcohol and drug abusers who suffer from illness or are in prison or jail and among persons who are victims of crime or accidents related to alcohol or drug abuse. Productivity losses also include the foregone lifetime earnings of individuals who died prematurely in 1992.
- **Other effects on society.** These include nonhealth costs associated with drug and alcohol abuse, such as the costs of crime and criminal justice, social welfare, motor vehicle crashes, or fires.

The outcomes of concern should be quantifiable both in their incidence and in the level of resource use associated with their occurrence. For example, the incidence of particular health problems and utilization of health services is tracked through nationally representative surveys. Mortality statistics are also compiled regularly by the U.S. National Center for Health Statistics, with deaths classified by their primary cause and appending data on age and gender of the decedent. Other data systems track other outcomes, such as criminal activity, property damage, and motor vehicle crashes. However, intangible outcomes, such as pain and suffering, generally are excluded from COI studies because they have not been reliably quantified.

A general set of categories of outcomes associated with alcohol and drug abuse is presented in table 3.1. Each of the items is actually a category comprising further subsets of outcomes—some of which can be quite extensive—that are analyzed later in this report. For example, the potential health consequences of alcohol and drug abuse (by which is meant the health problems that can be caused by alcohol and drug abuse) are quite extensive. There are, of course, other consequences of alcohol and drug abuse, many of which could not be estimated in this report. Table 3.1 refers to several of these consequences.

Table 3.1 mentions that “support” for specialty treatment is included as a cost. Support costs include training, research, and insurance administration. Some experts argue that training and research costs are investments in the Nation’s health care system and do not represent a “cost” per se. This study only applies training and research costs as they pertain to the treatment and prevention of alcohol and drug abuse (and not to the health care system as a whole). This is because the training and research programs are specific to the alcohol and drug abuse fields and are not necessarily exportable to the rest of health care. Without alcohol and drug abuse, these investments would not be necessary.

Table 3.1

Consequences Assessed in Cost-of-Illness Analyses

	Value of Goods and Services	**Value of Lost Productivity**	**Generally Nonquantifiable Costs**
Health	• Specialty drug/alcohol treatment and prevention • Support for specialty treatment, including training, research, and insurance administration • Health consequences of alcohol and drug abuse, including hospital care, physician services, nursing home care, and pharmaceuticals, or the continuum of services for certain special disease categories such as HIV/ AIDS, fetal alcohol syndrome, drug-exposed infants and boarder babies, hepatitis, and tuberculosis	• Reduced or lost earnings while impaired or unemployed • Lost earnings due to premature death or to institutionalization	• Pain and suffering • Bereavement • Psychosocial development impairment among alcohol and drug abusers and their children • Familial health • Out-of-pocket costs other than deductibles and copays, such as transportation, child care, and other factors associated with health care use.
Other (Non-health)	• Criminal justice system expenses, including protection, adjudication, and corrections • Victim expenses • Crime-related property destruction • Administration of income transfer programs • Motor vehicle crashes • Fire destruction	• Lost earnings while crime victims cannot work • Lost earnings while criminals are incarcerated • Lost legitimate earnings, including lost tax dollars due to "careers of crime"	• Reduced product quality • Secondary market effects • Productivity consequences for family members • Productivity consequences for coworkers and firms that are not reflected in the earnings of alcohol and drug abusers

In estimating the costs of alcohol and drug abuse for a particular year (the "base year"), two general approaches are available: use of incidence versus prevalence rates. The important distinction in these approaches has to do with the period in which consequences to be counted occur:

- Prevalence-based estimates count all costs incurred in the base year that result from instances of alcohol or drug abuse originating any time during or before the base year.

- Incidence-based estimates count all costs incurred any time during or following the base year that result from instances of alcohol or drug abuse originating during the base year.

This study, like previous COI studies of alcohol and drug abuse, relies primarily on **prevalence-based estimates**. That is, this study estimates the consequences—and costs—incurred in 1992 as a result of alcohol or drug abuse that occurred any time during or prior to 1992. For example, this approach tallies all health care costs in a year that are associated with AIDS cases caused by drug abuse (where the "incidence" of needle use very likely occurred in a previous year).

A different approach would be to count the "incidences" during the year that are caused by alcohol or drug abuse—for example, all new HIV infections. Calculation of costs using this approach would generally rely on a determination of the net present value (NPV) of costs associated with the consequences during the expected lifetime of the case from infection until death. Using the example of drug abuse-caused AIDS cases, the NPV of the costs of care for persons with HIV/AIDS would be applied to the incidence, or number of people who contracted HIV during the year.

The case of premature deaths is, however, a "hybrid" case. We first estimate the number of alcohol- and drug-related deaths that occur in the base year regardless of the onset of alcohol or drug abuse. The value assigned to those deaths is calculated as the present value of expected lifetime earnings that would have been generated by those individuals.

3.3.2 Causality

Estimating the role of alcohol and drug abuse as causal factors for various adverse outcomes is a central issue in any study estimating the COI for alcohol and drug abuse. Upon determining the *plausible* consequences of alcohol or drug abuse, the analyst must assess and quantify the extent to which alcohol or drug abuse may have caused the specific consequences.

3.3.2.1 Theoretical Aspects of Causality

Establishing causation has been the topic of considerable theoretical discussion and applied research for decades. The most fundamental concern underlying COI studies is struggling over the distinction between *association* and *causation*. Researchers have identified at least three basic conditions that are required before one can infer that an association represents a causal relationship (Berry 1984; Austin and Werner 1974). They are as follows:

- Strong and consistent correlation or covariance between phenomena;

- A coherent logic to the causal linkage, including correct temporal ordering; and

- Elimination of alternative possible causes.

Although the first two requirements are more straightforward, the third presents analysts with the greatest challenge. It is impossible to eliminate all potential other causes; moreover, a "cause" may have precursors that undermine the causal connection. For example, research into the etiology of alcohol and drug abuse has identified several individual and environmental factors that contribute to the likelihood that a person will have problems with alcohol or drug abuse—some argue that these are the "real" causes of a person's problems.

In eliminating alternative possible causes, the analyst must also be concerned with the "counterfactual." The counterfactual essentially is the answer to the question: What would be the likelihood that a person would have a particular negative consequence if he or she were not experiencing problems with alcohol or drugs? The following questions illustrate the complexities:

- If a criminal did not have a problem with alcohol or drug abuse, would that person still have difficulties with the law? Underlying factors in a person's personality or environment may contribute to criminal activity.

- Is it appropriate to assume that a person's wage rates were driven lower because of alcohol or drug abuse, or would the same person still experience lower rates even without the alcohol or drug problems?

- Does the fact that a driver consumed alcoholic beverages shortly before a crash mean that alcohol necessarily caused the crash? Many fatal crashes occur late at night, when drivers are tired and often less attentive. Many of these drivers have also been drinking. Simply counting the proportion of crash drivers that had been drinking fails to account for the generally more hazardous driving conditions at that time.

A "causal" estimate should use logic and analysis to estimate the extra risk posed from drinking and driving. However, even with the best data, most theoreticians concede that certain simplifying assumptions will always need to be made (Asher 1983; Austin and Werner 1974).

Moreover, the analyst must recognize that alcohol and drug abuse definitionally result in some consequences, whereas alcohol and drug abuse may directly or indirectly contribute to other consequences. For example, although alcohol or drug abuse does not cause all HIV/AIDS cases, it may play a direct or indirect role in some cases. Needle sharing among intravenous drug users may *directly* result in the transmission of HIV; alcohol or drug use may result in unsafe sex practices and thereby *indirectly* result in the transmission of HIV.

The causal role of alcohol or drugs may be very difficult to disentangle, but it is critical to acknowledge the difference between association and causality. The analyst who wishes to make COI estimates for multicausal consequences will have to evaluate the adequacy of empirical data that differentiates association and causation and decide whether to apply an explicit "judgment factor" in adjusting measures of association into an estimate of causality.

3.3.2.2 Practical Aspects of Establishing Causality

This study has assembled information that reviews and justifies the estimate(s) of how much of given consequences is caused by alcohol and drug abuse. As noted previously, some consequences of alcohol or drug abuse are definitional or are made by an external source. For example, some health diagnoses have been defined as being caused by alcohol or drug abuse (e.g., alcoholic cirrhosis or withdrawal from heroin). In such cases, analysts need only tally the number of diagnoses for such conditions treated in hospitals or listed as causes of death in mortality statistics. Other examples include criminal offenses that are defined as being related to alcohol and drugs. For some consequences, administrative determinations may be made about the role of alcohol or drugs. This is the case for some disability programs in the United States. Again, for such cases, analysts need only look at tallies of cases from administrative data bases.

A more challenging situation occurs when alcohol or drug abuse is one of multiple causes of particular consequences, such as liver disease, certain cancers/neoplasms, motor vehicle crashes, crime of various types, and employment problems. The objective is to develop an estimate of the proportion of the multicause consequence that can be attributed to alcohol and drug abuse. To accomplish this, we conducted literature reviews for evidence concerning the causal relationships between factors and interviewed experts where necessary and appropriate. In some cases, multiple estimates of causality were available, which were synthesized (generally by selecting a midpoint value).

This study relies on research into the causal role played by alcohol in mortalities to estimate certain hospital care and ambulatory medical care costs. This research into the underlying causes of death (beyond the listed diagnosis) is well documented and supported. Some experts have argued that mortality data are not appropriate for use in estimating health care utilization among the living. However, at face value, the proportion of deaths for a given condition that are caused by alcohol need not be different from the proportion of hospital episodes for the same condition. If alcohol caused 75 percent of malignant neoplasms of the esophagus that resulted in death, it seems plausible to assume that the same proportion of hospital episodes for that condition also were caused by alcohol abuse. However, using attribution factors based on alcohol's role in mortality from various causes to infer alcohol's role in generating morbidity in various diagnostic categories probably imparts a conservative bias to the resulting estimates. This is because such attribution factors do not reflect the causal role of alcohol in other, nonfatal conditions (or in diseases that may be present at death but that are not the cause of death). This is an area where further empirical evidence would be useful.

This study determined that for some potential consequences of alcohol or drug abuse, compelling empirical evidence regarding the role of alcohol or drug abuse is not available. Two examples are (1) the role of alcohol or drug abuse as a causal factor in other mental disorders among the dually diagnosed populations (summarized in this report but not included in the totals) and (2) the role of cocaine use in contributing to heart disease (not included in this report).

One of the most difficult issues around causality is the question of whether abuse of alcohol and drugs cause subsequent mental illness or whether preexisting mental illness makes people more susceptible to abusing drugs and alcohol, perhaps in an attempt to "self-medicate" their problems. This is one of the major and largely unresolved epidemiological (and clinical) issues involved with alcohol and drug abuse.

Although prior studies simultaneously developed separate estimates for alcohol abuse, drug abuse, and mental illness, this effort developed estimates only for drug and alcohol problems. In fact, many of the costs estimated in this study occur to individuals who are afflicted with multiple alcohol, drug, and mental disorders. A review of the literature indicates that up to 75 percent of persons with drug problems also have problems with alcohol abuse and/or mental disorders and up to 50 percent of persons with alcohol problems have problems with drugs and/or mental disorders. In contrast, among the population with mental disorders it appears that about 20 to 30 percent have problems with alcohol and/or drugs. How persons are classified with respect to these disorders has a substantial impact on the cost estimates—the impact of the methodology choice is to shift costs among the alcohol, drug, and mental disorders, although this may be more based on data limitations than on the nature of the patients and disorders presenting for treatment.

Researchers in this study chose middle-of-the-road methodologies that split the difference between attributing particular costs solely to mental illness or to alcohol and drug abuse. In the most recent study by Rice et al. (1990)—and to a certain extent in earlier studies—methodologies were used that assigned all of selected costs to mental illness. This has primarily been an issue in estimating health care expenditures, although it is also highly pertinent to understanding the effects of alcohol and drug problems on success in the labor market. Failure to recognize and adjust for co-occurrence of mental disorders probably leads to an overestimate of the costs of alcohol and drug problems, unless the mental disorder has been caused by alcohol or drug abuse.

3.3.3 Cost or Valuation Techniques

The final step in a COI study is to assign values to the consequences and the associated flows of resources. In some cases, such as with goods and services provided by private or public institutions, this valuation is straightforward. In other cases, such as with the value of lost productivity resulting from illness or premature death, this involves more complicated theoretical reasoning and data.

3.3.3.1 Valuation of Goods and Services

Assigning values to goods and services simply requires that the analyst know the average costs involved. For example, the per diem expenditure in a hospital in 1992 was $816 (National Center for Health Statistics 1996a). If one-half of the episodes of a medical condition are caused by alcohol abuse, then one-half of the annual days of care for treatment of that condition could be allocated to alcohol abuse, at the cost of $816 per day. The most appropriate measures for this purpose are prices that represent the unit cost of purchasing, producing, or replacing the resource flow that has been measured. Average or typical charges for services may be substituted when actual costs are not available, under the premise that in the long run, charges will equal costs.

Expenditures for health and nonhealth goods and services are generally straightforward to value, particularly where resources and services are exchanged in a market. Average price/cost data are usually available for health care services, such as a day of hospital care or a visit to a physician. It is generally acceptable to use such average prices; however, if data are available that can provide more differentiated costs, they should be used. Examples of such data include days and prices for alcohol and drug abuse-related hospital intensive care versus general hospital ward and visits to medical specialists versus general practitioners.

Other publicly provided services, such as criminal justice services and highway safety efforts, often do not have good data on prices and costs that can easily be allocated to alcohol and drug abuse. However, there is generally a total budget for these public services. If a total budget is available, an estimation technique must be developed that divides the budget between alcohol and drug abuse-related efforts and other efforts. For example, one approach to the valuation of police protection is to estimate the proportion of arrests that is attributable to alcohol and drug abuse and then apply this proportion to the total budget for police protective services.

3.3.3.2 Valuation of Lost Productivity

Economic costs have been estimated using the "human capital" approach to valuation of loss of expected productivity that a person would have achieved in the study year (for morbidity) or over the person's expected course of life (for mortality). The human capital approach to calculation of productivity costs has been generally used in COI studies (Hodgson and Meiners 1982) and in the prior studies of alcohol and drug abuse (exceptions are Miller et al. 1997a,b). Using this approach, a dollar value is assigned to production that is lost because of illness, impaired functioning in the labor force, and premature death. This dollar value is based on data regarding actual earnings found among alcohol and drug abusers and earnings of comparison populations not affected by alcohol or drug abuse using age- and gender-adjusted national data.

The human capital approach is in contrast to the "willingness-to-pay" approach, which attempts to reflect both expected loss of productivity (the essence of the human capital approach) as well as the "value" of pain and suffering. To simplify the difference between human capital and willingness-to-pay approaches, willingness-to-pay counts the value that a person (typically, the alcohol or drug user or, potentially, his or her family) would place on not experiencing impairment or death from alcohol or drug abuse. Cost-benefit studies in highway safety and pollution control use the willingness-to-pay approach (Miller et al. 1991). This approach has not been directly adapted and applied to alcohol and drug abuse.

The human capital approach involves several technical issues, particularly adjustments to average wage rates. First, average wage rates should be adjusted for several factors, including the expected level of employment and the value of "fringe" benefits and taxes that may never appear in a paycheck. Fringe benefits and taxes should be included because they are part of the contribution of labor's productivity. To stay in business, employers have to recover these expenses from the productivity of workers. Also, average wage rates should be adjusted for both age and gender. This is valuable because alcohol abuse and drug abuse are not uniformly distributed across demographic groups; they tend to be concentrated among young males. Finally, the rates should also be adjusted to reflect some value to the household for productivity outside of the workforce.

It could be argued that productivity/earnings estimates should be adjusted down to account for expected living expenses and affected persons' consumption of their earnings. However, this argument implies that consumption by these affected persons does not matter to society, and that the social welfare function only values the surplus of earnings that is passed on to savings, family and friends, and taxes. Although this latter approach may be correct for valuation of life insurance, it is not the approach that has been taken in most COI studies, and no such adjustments have been applied in this study.

Moreover, some of the economic consequences that initially fall on alcohol and drug abusers are redistributed to other persons through insurance mechanisms of different types, including health insurance and unemployment and disability insurance. Even when lost or reduced earnings are not compensated through transfer payments, the impact may be spread beyond alcohol and drug abusers to their family and friends. Researchers need to be very careful in how they work with transfer payments that redistribute resources.

Transfer payments (e.g., the cash value of food stamps and payments from Aid to Families with Dependent Children and other welfare/general assistance programs) are not added into total cost estimates but, nonetheless, are shown as "redistributions" from one segment of the Nation to another (alcohol and drug abusers). There is no net loss from society's perspective, although taxpayers and public decisionmakers may see this quite differently. The primary reason for excluding transfer payments from total cost estimates, however, is that "double counting" may arise if both the initial cost of the programs and the value of lost productivity (which social welfare programs are designed to ameliorate) are counted. The cost of administering transfer payment systems is, however, a real cost.

Contention remains regarding at least two particular issues in application of human capital estimates to alcohol and drug abusers: (1) the expected future course of productivity and (2) the appropriate discount rate to use in the calculations.

- **The expected future course of productivity.** This term represents the "counterfactual" wage and earning potential for an alcohol or drug abuser. Counterfactual in this context refers to what would plausibly be the case if alcohol or drug abuse were suddenly eliminated or had never existed. It is possible that a person with an alcohol or drug abuse problem may have held (and lost) lower wage jobs than the general population. The question is whether such a factor would justify using values lower than those for the general population in estimating future productivity. The rationale for *not* making such an adjustment or reduction is that if alcohol or drug abuse caused the initial/current deficit relative to expected productivity, then future deficits will probably also be caused by those problems. Although it is likely that they would have had lower future productivity, this would be caused by and attributable to alcohol and drug abuse, and making the adjustment would miss a material impact and cost that should be counted.

- **Selecting an appropriate discount rate for human capital estimates.** This is a contentious issue in estimating the value of productivity effects (Burkhead and Miner 1971). A high discount rate gives a lower present value of expected earnings, and a low discount rate gives a higher present value of expected earnings. There is extensive debate about what rate is appropriate for what kinds of studies. Higher rates (such as 8 to 10 percent) are used when there is more risk or uncertainty associated with a stream of values, whereas lower discount rates (2 to 4 percent) are used when there is less risk or uncertainty around events. Also, higher rates give preference to current benefits and consumption, and lower discount rates give more emphasis on future consumption and benefits. The major prior alcohol and drug studies have used a value in between—6 percent—and the primary justification for using this value may be to allow comparability with previous estimates. However, it appears that lower values, such as 3 percent, are being used in much cost-benefit work for the Office of Management and Budget. This study reports costs using 3 percent, 4 percent, and 6 percent and uses the more conservative 6-percent figure (that is, it gives lower cost estimates) in constructing and reporting the total estimates.

Using the human capital approach, deaths of males and females ages 35 to 39 represent costs of about $700,000 and $500,000, respectively, using a 6-percent discount rate. Using a 3-percent discount rate would yield costs of about $1 million and $700,000, respectively. This clearly illuminates two issues inherent in the human capital values: (1) males tend to have higher values than females, and (2) there is continuing debate over appropriate discount rates.

Actually, much higher costs would result from application of the willingness-to-pay approach. A review of the willingness-to-pay literature found an average value per death across 47 studies of $2.3 million in 1989 dollars (cited in Miller et al. 1995). Adjusted for 3 years of inflation (about 12 percent to $2.55 million per death), this approach would indicate losses of $275 billion for alcohol-related mortality and $61 billion for drug-related deaths. These values are about nine and four times greater, respectively, than the estimates obtained using human capital values reported elsewhere in this volume. Both the application of the technique and the estimated values should be given further consideration. It was found that for smoking behaviors, there were substantially lower willingness-to-pay values. Therefore, the questions must be asked, “Would the willingness-to-pay to save the life of alcohol and drug abusers (by themselves and/or by others) theoretically and actually be different from values for other types of risk?” and “How would these values compare with other willingness-to-pay values?”

3.4 Sources and Limitations of Data

The ability to develop more or less detailed COI estimates is ultimately determined by the availability of data. This study has utilized dozens of different data sets and previous investigations. Priority is given here to studies that are broadly representative and, at the same time, have the design and content to support the very specialized analyses this project requires. Care is taken in the body of this report to identify all data sets and studies that have been used as inputs. Furthermore, this report provides descriptive information about data sets and studies to give the reader an informed sense of the strengths and limitations of the data used. However, providing comprehensive assessments and documentation for each data set and study that has been used in the present study is not possible.

This study benefits from a decade of improvements in the quality of data and advancements in areas for which data are available. However, the availability and quality of data remain, unfortunately, uneven. Simply put, there is no single source of data that addresses the numerous health and related sequelae of alcohol and drug abuse. As a result, this study has sought out many complementary sources of information that include the following: general-purpose surveys, administrative data sets, special studies, and expert judgment.

The most basic data come from general-purpose surveys and administrative data sets that often have limited information about alcohol and drug abuse. Large surveys used here are generally representative of the United States but often do not include certain data elements about alcohol and drug abuse and its role in the issue under investigation in the survey. Administrative data provide useful information about resources and services that complements survey data, particularly regarding services provided in the public sector (e.g., social welfare). Special studies (e.g., studies of clinical populations in a few treatment settings) are useful for exploring intricacies but are not designed to represent the United States. Nonetheless, all such data are extremely valuable, because they provide both bases from which estimates of alcohol and drug abuse-related costs can be derived and—if good, specific data bases on alcohol and drug abuse exist—standards against which estimates can be compared. Table 3.2 lists examples of surveys and administrative data sources used or analyzed in this report.

One type of data that is not used in this report is health care claims data. Health care claims data would provide an alternative to survey measures of specialty treatment services and for all types of costs associated with medical consequences. However, many alcohol and drug abusers do not have health insurance and, accordingly, no claims records exist for care they receive. Moreover, the survey data that are used provide a nationally representative picture of health care. Claims data are idiosyncratic to the insurers or employers that have provided the data. Nonetheless, claims data may constitute a potential source of information for future analyses of special topics.

The most critical data for alcohol and drug abuse COI studies are data concerning the relationship of alcohol and drug abuse to the consequences of concern. These data are likely to vary greatly in their utility and quality and in the approach used to obtain them. The most basic studies will be those that simply examine and report on the involvement of alcohol and drug abuse in the consequence of concern (Did the victim of throat cancer drink? Had the driver of the crashed vehicle consumed alcohol before driving?). Even studies with such limited objectives can be performed more or less rigorously, based on factors such as the nature of the sample (representative or purposive sample), size of the sample, and how the data were collected (self-report or from tests, such as blood alcohol or urinalysis).

However, studies that move beyond association toward causation are the most critical for the credibility of this study. As discussed previously, alcohol and drug abuse are behaviors that often occur in combination with other problems, most notably risk-taking or criminal activities. This suggests the possibility and, indeed, the likelihood that alcohol and drug abuse and certain negative consequences may be partially related to other underlying factors, values, or predispositions.

Table 3.2

Selected Data Sources Used in This Report

Data Source	Period Covered by Data	Reference
Budget of the United States Government	1992	Office of Management and Budget (1993)
Drug Use Forecasting	1992	U.S. Department of Justice (1994d)
Fatal Accident Reporting System	1992	Blincoe and Faigin (1992)
Inventory of Mental Health Organizations	1990	Manderscheid and Sonnenschein (1994)
Justice Expenditure and Employment	1990	U.S. Department of Justice (1992b)
Mortality Data	1992	National Center for Health Statistics (1996b)
National Ambulatory Medical Care Survey	1992	National Center for Health Statistics (1994a)
National Crime Victimization Survey	1990	U.S. Department of Justice (1993c)
National Drug and Alcohol Treatment Unit Survey	1991	Substance Abuse and Mental Health Services Administration (SAMHSA; 1993a)
National Hospital Discharge Survey	1990–1992	National Center for Health Statistics (1993, 1994b)
National Household Survey on Drug Abuse	1974–1995	SAMHSA (1993b, 1994, 1995, 1996a,b)
National Longitudinal Alcohol Epidemiologic Survey	1992	Grant and Dawson (1996)
National Nursing Home Survey	1992	National Center for Health Statistics (1991)
Federal Drug Control Budget	1992	Office of National Drug Control Policy (1995)
State Alcohol and Drug Abuse Profile	1992	National Association of State Alcohol and Drug Abuse Directors (1994)
Survey of Prisoners and Inmates	1991	U.S. Department of Justice (1994e)
Uniform Crime Reports	1992	U.S. Department of Justice (1994b)

Studies of causality, therefore, need to use measures of alcohol and drug abuse behaviors that may be logically related to the consequence at hand. In the case of motor vehicle crashes and other accidents, the standard measure is usually blood alcohol concentration. Use of such measures must be supported by meaningful scientific literature, such as studies demonstrating that physical coordination and the ability to perform certain tasks (mental or physical) are likely to be progressively impeded above specified blood alcohol concentration values.

Studies of alcohol and drug abuse effects on worker productivity should look beyond simple patterns of consumption and toward signs that alcohol and drug abuse is chronic and severe, to the degree that it regularly affects individual lives and a person's ability to function in the home, in the workplace, and in society at large. Such patterns of problems are integral to making clinical diagnoses of alcohol and drug abuse and dependence, so studies of the relationship of alcohol problems to employment and productivity should attempt to use clinical criteria for abuse and dependence if the specific data base has sufficient detail and quality of information.

The need to use clinical criteria becomes particularly clear given that some studies have detected a positive relationship between earnings/employment and alcohol consumption. For example, greater proportions of higher income populations tend to be consumers of alcoholic beverages than is the case among relatively lower income populations. Such a finding does not necessarily contradict the hypothesis that abuse of alcohol and drugs is likely to have a negative impact on employment and/or earnings. Instead, clinical diagnoses are needed to differentiate persons for whom alcohol consumption has led to detrimental symptomatology that adversely affects employment and/or earnings. Analysis of alcohol and drug abuse and employment will need to recognize and model or control for both a clinical phenomenon associated with pathological consumption and the more pervasive "consumption-function" relation. Without modeling these complex relationships, studies will probably yield inconsistent results.

3.5 Conclusion

COI studies serve to summarize and highlight the many disparate dimensions of alcohol and drug abuse. Data derived from these studies are considered quite valuable to both public figures and private advocates who are working to address the problems of alcohol and drug abuse. COI studies also help place the problems of alcohol and drug abuse into perspective. For instance, decisionmakers may be more interested from time to time in specific aspects of health costs, deaths, or other disease sequalae—all of which can be informed by COI studies.

Still, COI studies cannot tell us how much to spend on prevention and treatment. The real burden in using economic logic to justify social policy is on the analysts and advocates of prevention and treatment services to document that these services can be, and are, effective. If these services are not effective, they can never be cost-effective or cost-beneficial. Knowing only that there is a massive cost associated with the abuse of alcohol and drugs is insufficient justification for any particular policy without knowing the potential effectiveness and cost of the proposed policy intervention.

4. HEALTH CARE COSTS

4.1 Synopsis

Treatment and prevention of alcohol and drug abuse problems and related health conditions are estimated to have cost almost $28.8 billion in 1992, of which about $18.8 billion was for alcohol problems and $9.9 billion was for drug abuse problems. Included in these estimates are the cost of specialty treatment, prevention, and support services for alcohol and drug abusers, as well as health care costs for treatment of the medical consequences of alcohol and drug abuse. Treatment of medical consequences includes inpatient and outpatient medical care, pharmaceuticals, and other services provided to persons suffering from conditions such as HIV/AIDS, infant drug or alcohol exposure, liver cirrhosis, and trauma. Findings from this analysis of health care costs are summarized in table 4.1 and include the following:

- Treatment and prevention of alcohol and drug abuse disorders cost about $9.0 billion, and training, research, and insurance administration for treatment and prevention services cost another $1.0 billion.

- Treatment of the medical consequences of alcohol and drug abuse cost about $18.8 billion.

- Medical consequences of alcohol and drug abuse resulted in costs of $6.3 billion for hospitalizations and $4.9 billion for other health care services (e.g., ambulatory care and medications).

- Special disease groups cost about $6.5 billion, including about $3.7 billion for drug abuse–related HIV/AIDS cases, $462 million for hepatitis, and $407 million for drug-exposed newborns.

Estimates reported in this study are greater than would have been expected given inflation from the previous estimate by Rice et al. (1990) for 1985 of $8.9 billion. Most of the differences can be attributed to (1) application of specific causal factors to estimate alcohol-related hospital days and other health care utilization and (2) inclusion of drug-related cases of HIV/AIDS, hepatitis, and drug-exposed newborns.

Table 4.1

Health Care Costs of Alcohol and Drug Abuse, 1992
(millions of dollars)

Cost	Total	Alcohol	Drugs
Specialty Services and Support			
Services:			
Alcohol or drug abuse treatment	$7,176	$4,046	$3,130
Alcohol or drug abuse prevention	$1,814	$1,088	$726
Support:			
Training	$122	$73	$49
Research	$536	$184	$352
Insurance administration	$325	$182	$143
Total, Specialty Services and Support	***$9,973***	***$5,573***	***$4,400***
Medical Consequences			
Health Providers:			
Hospitalization, non-Federal	$5,846	$5,328	$518
Hospitalization, Federal	$495	$451	$44
Outpatient medical	$1,749	$1,749	0
Nursing homes	$623	$623	0
Pharmaceuticals	$1,581	$1,581	0
Other health professionals	$935	$935	0
Special Disease Groups:			
Fetal alcohol syndrome	$1,944	$1,944	0
Drug-exposed infants, etc.	$407	0	$407
Tuberculosis	$30	0	$30
HIV/AIDS	$3,700	0	$3,700
Hepatitis	$462	0	$462
Violent crime	$105	0	$105
Health Insurance Administration	*$901*	*$636*	*$265*
Total, Medical Consequences	***$18,778***	***$13,247***	***$5,531***
TOTAL	**$28,751**	**$18,820**	**$9,931**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

4.2 Specialty Treatment for Alcohol and Other Drugs

4.2.1 Alcohol and Drug Abuse Treatment

It is estimated that more than $7.1 billion was spent on specialty treatment services for alcohol and drug abusers in the United States in 1992. This study estimates that about $4.0 billion was spent to treat clients primarily for alcohol abuse or dependence and $3.1 billion was spent to treat clients primarily for drug abuse or dependence.

More than 11,000 treatment units in the United States provide rehabilitation, counseling, case management, and other types of services to persons and their families who have problems with alcohol or drug abuse. Many more individual physicians, psychologists, and social workers provide these types of specialty services. Harwood et al. (1994) estimated that in 1993, more than 3 million persons received 5.8 million episodes of specialty drug or alcohol treatment services in non-Federal hospital- and community-based treatment units. About 60 percent of the clients in treatment were there primarily for alcohol problems, whereas about 40 percent were in treatment primarily for drug abuse problems.[1] These estimates are based on analyses of the 1991 National Drug and Alcohol Treatment Unit Survey (NDATUS), which were adjusted for survey and item nonresponse. Analyses of the National Ambulatory Medical Care Survey (NAMCS) also yielded numbers of visits to psychiatrists and physicians.

The primary analytic approach used by Harwood et al. in the 1994 report was to build on the data included in NDATUS, with adjustments for known limitations. The findings from NDATUS have then been compared with data from the other sources identified above, in order to identify alcohol and drug abuse treatment services beyond those reported to or deducible from NDATUS.

Most specialized alcohol and drug abuse treatment services are delivered by identified specialized providers, such as certified alcoholism and drug abuse counselors or programs including specialized hospitals (or units within hospitals), residential facilities, and various types of stand-alone ambulatory care providers. Such providers are classified under the rubric of the "specialty alcohol and drug abuse treatment system." In addition, a modest amount of care for alcohol and drug abuse disorders is delivered by other types of health care providers, including short-term general hospitals and mental health providers.

The following sections review the data sources selected for this study, adjustments made to these data, and the final calculations of costs for specialized alcohol and drug abuse treatment.

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[1] Analyses of the 1991 National Drug and Alcohol Treatment Unit Survey by Harwood et al. (1994) indicated that 48 percent of current clients were treated for alcohol problems only, 28 percent were treated for drug problems only, and 24 percent received treatment for both drug and alcohol problems. Splitting the group of comorbid clients in half and adding them to the alcohol- and drug-only numbers yields 60-percent alcohol and 40-percent drug treatment.

4.2.1.1 Data Sources and Overlaps

A number of distinct surveys collect and report data about service delivery and expenditures. The primary surveys for the specialty alcohol and drug abuse treatment system include the NDATUS and the Drug Services Research Survey (DSRS). These are the primary data sources and references used for this report in compiling estimates. In addition, they have been complemented by accessing data from the Inventory of Mental Health Organizations (IMHO), National Health Expenditures (NHE), Hospital Statistics (HS), National Hospital Discharge Survey (NHDS), and NAMCS.

A critical analytic issue is that there are overlaps in the coverage of several of these surveys. For example, hospitals, as the major health delivery institutions in the health care system, are covered by NDATUS, DSRS, IMHO, HS, and NHDS. Another major overlap involves freestanding facilities reporting to NDATUS, DSRS, and IMHO. For purposes of this report, these data sources and surveys have been carefully analyzed and compared in order to construct a comprehensive estimate of what kind of treatment is being delivered, in what amounts, and by what kind of providers.

Some experts have questioned whether NDATUS data on hospitals is of comparable quality to that for other types of alcohol and drug abuse providers. Based on this analysis, it appears that with adjustments, NDATUS provides estimates of at least adequate quality. Analysis of NDATUS with adjustments indicates that 17,500 patients are in hospital treatment on a given night and that a total of 296,000 unduplicated patients received hospital inpatient care in 1991. Because of relapse and the need for multiple treatment episodes, there were an estimated 593,000 hospital admissions for specialized alcohol and drug abuse treatment.

One class of providers that NDATUS does not include is that of mental health professionals in private practice, including psychiatrists, psychologists, and social workers. The best data available are for psychiatrists in private practice. NAMCS studies a nationally representative sample of medical doctors in private practice. An estimated 43,000 psychiatrists are practicing in the United States (American Medical Association 1992), of whom an estimated 45 percent are engaged in private practice, seeing an average of 1,440 appointments per year (Dorwart et al. 1992).

Private-practice psychologists and social workers also may treat alcohol and drug abusers. There are 42,000 and 72,000, respectively, of such private practitioners engaged primarily in private practice (Health Resources and Services Administration 1991). Fees paid to psychologists and social workers are assumed to be 50 percent and 75 percent less per visit than those for psychiatrists.

In addition, there are about 35,000 alcohol and drug abuse counselors, according to the National Association of Alcoholism and Drug Abuse Counselors. The vast majority of these professionals primarily practice within programs; therefore, these services are included in the data reported in NDATUS. Relatively few of these professionals also have private practices. Moreover, some of these professionals probably are counted in national estimates of private-practice psychologists and social workers because these are the disciplines in which many counselors have their advanced training. Therefore, separate estimates have not been developed for alcohol and drug abuse counselors.

Finally, little or no data exist concerning the extent and cost of self-help group participation and operation. Groups such as Alcoholics Anonymous provide help for persons with alcohol or drug abuse problems; other types of groups help family members and other persons who are affected by alcohol and drug abuse. Some groups are convened through traditional treatment programs, and any costs are reflected in those programs' operating costs. Other groups rely on volunteers and meet (typically) in donated meeting space. The cost of using the space, as well as books or other materials acquired by self-help participants, could be tallied, but such data are not currently available.

4.2.1.2 Adjustments to Data Sources

Three kinds of adjustments were made to the data sources used in this study: adjustments for program nonresponse, adjustments for survey item nonresponse, and adjustments to control for client relapse to treatment.

4.2.1.2.1 Program Nonresponse

The 1991 NDATUS census of specialized alcohol and drug abuse treatment units achieved a response rate of 81 percent. All estimates (programs, current clients, annual unduplicated clients, and annual revenues) were adjusted up by 23.5 percent (computed as 100/81 percent). It is assumed for this analysis that nonresponse indicated failure of a program to complete the survey rather than nonexistence of a program. This assumption seems justified because before the NDATUS survey was mailed out, intensive work was put into identifying the universe of operating programs by contacts with State licensing authorities and associations of types of providers in compiling the census for the survey.

Moreover, although the 1991 NDATUS did obtain data from 1,307 community mental health centers, analysis of the IMHO indicated that even after adjusting for program nonresponse, NDATUS underestimated clients served and revenues for alcohol and drug abuse treatment services by about one-third. This adjustment is contained in all of the estimates presented in this report.

4.2.1.2.2 Item Nonresponse

Item nonresponse on selected variables was dealt with by statistical analysis. In particular, annual unduplicated clients and annual program revenues were affected, with item response rates of 62 and 82 percent, respectively. Imputed values were developed by regressing unduplicated clients and total program revenue, respectively, on current clients (by modality of treatment). There are strong differences in these relationships by modality, as would be expected.

The 5,449 programs with data on unduplicated clients reported serving 1.77 million clients in the prior year. Imputations for the 3,386 programs with missing estimates of unduplicated clients added 1.24 million clients, for a 70-percent increase. The second adjustment of 23.5 percent for program nonresponse increased the total to 3.72 million. This estimate was later adjusted downward to about 3.0 million to account for patients that were probably treated by more than one program over the course of the year.

4.2.1.2.3 Adjustments for Returns to Treatment

The estimates of annual unduplicated clients and of admissions were also adjusted to account for patients who received multiple types of treatment and/or relapsed and were readmitted to treatment within a year. The DSRS (Institute for Health Policy 1993) found that more than 50 percent of patients admitted to treatment had received treatment from the same or another program within the 12 months before the current treatment. These previously admitted clients had an average of 1.4 to 1.5 admissions in the prior year. Thus, on average, alcohol and drug abuse patients had about 1.9 treatment admissions per year (including the episode counted by DSRS).

The national estimates of annual unduplicated clients and annual admissions are highly sensitive to whether relapsed clients were readmitted to the same or different treatment programs. For example, calculations from NDATUS (adjusted for item and program nonresponse, as explained above) indicated that there were about 3.7 million annual unduplicated clients. If it is assumed that relapse always resulted in admission to the same treatment program (and as a result there is no duplication of clients treated in data for different programs), then the 3.7 million persons had 1.9 treatment episodes each, for a national total of about 7 million episodes.

However, if relapsing clients always enter a different treatment program, then the estimate of 3.7 million unduplicated clients must be adjusted down (divided by 1.9 episodes per person) to account for clients that were treated in more than one program in a year. Thus 1.9 million unduplicated clients (3.7 million divided by 1.9 episodes per person) would have received a total of 3.7 million treatment admissions. If it is assumed that relapsing clients are equally likely to enter the same or a different program, then the national totals are 2.5 million unduplicated clients receiving 4.8 million treatment episodes.

This study has assumed that relapsing clients usually (in 75 percent of the cases) reenter the same treatment program. The logic for this assumption is that clients have previously received help from the institution and are believed to be more likely to turn to therapists and institutions that have helped them at least once before. This assumption implies that the estimate of 3.7 million unduplicated clients is actually 3.0 million after adjustment and that these clients had a total of 5.7 million treatment admissions.

4.2.1.3 Estimates of Service Use and Costs

Table 4.2 displays the number of clients in each type of care as reported by NDATUS. Because various types of treatment have different lengths of stay, the distribution of clients across modalities is different for "current clients" and "annual unduplicated clients." For example, outpatients tend to stay in treatment for much longer periods than inpatients. About 90 percent of current clients are enrolled in outpatient treatment. However, over the course of a year, only about two-thirds of clients are in outpatient treatment. The estimates of annual unduplicated clients and of admissions have been adjusted to account for patients who receive multiple types of treatment and/or relapse and are readmitted to treatment in a year.

Table 4.2

Alcohol and Drug Abuse Treatment Services in Treatment Units

Modalities	Current Clients (thousands)	Unduplicated Clients (thousands)	Annual Admissions (thousands)
Hospital	17.5	296.0	591.7
Freestanding detox center	7.3	210.2	420.2
Short-term residential	20.7	248.3	498.5
Long-term residential	63.8	213.4	428.4
Outpatient	816.2	1,879.5	3,449.0
Methadone	117.0	145.1	345.3
Other providers	11.1	44.5	81.7
TOTAL	**1,053.6**	**3,036.9**	**5,814.8**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

Several Federal- and State-funded institutions and health care arrangements also provide or cover alcohol and drug abuse treatment services for the military, veterans, prisoners, and Native Americans. The Office of National Drug Control Policy (ONDCP) reports each year on Federal expenditures for drug abuse treatment services in the Department of Defense, Department of Veterans Affairs, Department of Justice, and the Indian Health Service. ONDCP's estimates have been doubled to account for the proportion of alcohol-only current clients served through these Federal agencies.

Specialty alcohol and drug abuse treatment services provided in 1992 cost an estimated $7.2 billion, of which $4.1 billion was primarily for alcohol abuse treatment and $3.1 billion was primarily for drug abuse treatment (see table 4.3). These cost estimates are based on the cost per client generated from analyses of the 1991 NDATUS by Harwood et al. (1994), adjusted for inflation to 1992, and budget figures reported by ONDCP for Federal agencies. Using NDATUS, Harwood et al. (1994) calculated that the per diem cost for a hospital-based treatment bed was between $340 and $440 (depending on source of payment).[2] In contrast, previous studies (e.g., Rice et al. 1990) have used the much higher average per diem cost for a non–alcohol- and drug-abuse treatment bed in general acute care hospitals, which was $816 in 1992 (exclusive of independent physician expenses). An analysis of outpatient visits to psychiatrists, psychologists, social workers, and other physicians primarily for alcohol or drug abuse are included in section 4.3.3. Costs for these services are included in table 4.3.

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[2] Hospital revenues reported to NDATUS include specialty units that may not be reported by the hospitals in other data and which typically operate on a lower per diem cost basis. The estimates used here are calculated using NDATUS revenues reported by inpatient units, divided by the annual client days in those units. The result is an estimate that falls between $340 and $440 per day, as opposed to $816 per day for acute care beds in short-term hospitals (National Center for Health Statistics 1995).

Table 4.3

Specialty Alcohol and Drug Abuse Treatment Services, 1992

(millions of dollars)

Services	Total	Alcohol	Drugs
Community-Based Treatment			
Hospitals	$1,621.6	$973.0	$648.6
Freestanding detox center	$233.1	$139.9	$93.3
Short-term residential	$903.3	$542.0	$361.3
Long-term residential	$1,011.9	$607.1	$404.7
Outpatient	$2,037.9	$1,222.7	$815.1
Methadone	$453.1	$0	$453.1
Psychiatrists, psychologists, social workers	$84.0	$50.4	$33.6
Other physicians	$101.9	$73.7	$28.2
Total, Community-Based Treatment	*$6,446.8*	*$3,608.7*	*$2,838.0*
Other Alcohol and Drug Abuse Treatment			
Department of Defense	$34.8	$20.9	$13.9
Indian Health Service	$64.4	$38.6	$25.8
Bureau of Prisons	$43.0	$25.8	$17.2
Veterans Affairs	$586.5	$351.9	$234.6
Total, Other Alcohol and Drug Abuse Treatment	*$728.7*	*$437.2*	*$291.5*
Total, Alcohol and Drug Abuse Treatment	**$7,175.5**	**$4,046.0**	**$3,129.5**

SOURCE: Adapted from Harwood et al. (1994).

NOTE: Components may not sum to totals because of rounding.

4.2.2 Prevention

Federal, State, local, and private sources $1.8 billion in 1992, of which $1.1 billion was allocated
Programs for the prevention of alcohol and drug abuse problems are estimated to have cost to
alcohol problems and the balance to drug abuse problems.

Federal, State, local, and private sources pay for programs to prevent alcohol and drug abuse. Federal prevention expenditures include the Federal Center for Substance Abuse Prevention as well as support through a 15-percent "set aside" in the Alcohol and Drug Abuse Prevention and Treatment Block Grants given to States and Department of Education programs. States also support prevention services. ONDCP (1995) estimates of Federal prevention expenditures are reported in table 4.4. Non-Federal prevention expenditures reported in table 4.4 include any State, local, and private expenditures on prevention activities that may have been reported by States for 1992 (National Association of State Alcohol and Drug Abuse Directors 1994). To calculate non-Federal prevention expenditures, block grant set-asides for prevention and a prorated proportion of other Federal revenues were deducted from the total State and local expenditures on prevention services. There are no nationally representative data bases of alcohol and drug abuse prevention service providers in the United States, as there are for treatment services. Allocations to alcohol abuse versus drug abuse are based on the estimated primary reason for treatment admissions described in section 4.2.1.

Table 4.4

Prevention Services, 1992
(millions of dollars)

Prevention Services	Total	Alcohol	Drugs
Federal (from ONDCP)	$1,538.7	$923.2	$615.5
Non-Federal prevention	$275.0	$165.0	$110.0
TOTAL	**$1,813.7**	**$1,088.2**	**$725.5**

NOTE: Components may not sum to totals because of rounding.

4.2.3 Support for Specialty Alcohol and Drug Services

Approximately $983 million, or 13.7 percent of the total costs associated with specialty alcohol and drug abuse treatment, was spent on training professionals, conducting research and development, and administering insurance benefits (see table 4.5).

Table 4.5

Support for Specialty Alcohol and Drug Services, 1992
(millions of dollars)

Support			Cost		
Training	**Personnel**	**Training Hours/Year**	**Total**	**Alcohol**	**Drugs**
New alcohol and drug abuse counselors	5,000	250.0	$12.5	$7.5	$5.0
Existing alcohol and drug abuse counselors	58,000	30.0	$29.0	$17.4	$11.6
Total, Alcohol and Drug Abuse Counselors	***63,000***	***47.5***	***$41.5***	***$24.9***	***$16.6***
Other professionals in alcohol and drug abuse	65,903	6.0	$6.6	$4.0	$2.6
Mental health professionals	994,403	2.0	$33.2	$19.9	$13.3
Other health professionals	2,837,535	0.5	$23.7	$14.2	$9.5
Law enforcement/criminal justice	1,721,622	0.5	$14.3	$8.6	$5.7
Clergy	340,000	0.5	$2.8	$1.7	$1.1
Total, Training			***$122.1***	***$73.3***	***$48.8***
Research and Development			***$536.3***	***$184.3***	***$352.0***
Health Insurance Administration			***$325.0***	***$182.0***	***$143.1***
TOTAL SUPPORT			**$983.4**	**$439.5**	**$543.9**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

4.2.3.1 Training

> *It cost approximately an estimated $122 million to train new and existing alcohol and drug abuse treatment and allied professionals in 1992. An estimated $73.3 million was allocated to alcohol abuse, and $48.8 million was allocated to drug abuse.*

The cost of alcohol and drug abuse training includes initial and continuing education for the following:

- Alcohol and drug abuse counselors,
- Other professionals working in alcohol and drug abuse programs and clinics,
- Mental health professionals not working in alcohol and drug abuse programs and clinics,
- Other health professionals not working alcohol and drug abuse programs and clinics,

- Law enforcement/criminal justice professionals, and
- Clergy.

Also included are certain Federal expenditures for training and staff development.

Harwood and Salinsky (1994) estimated the number of new and existing alcohol and drug abuse treatment counselors and training costs. Typically, 60 hours of CEU's (continuing education units) over a 2-year period or 30 hours per year are required for existing counselors to become credentialed in alcohol and drug abuse counseling. New counselors require an average of 250 hours to become credentialed as alcohol and drug abuse counselors. It is estimated that 60 percent of the estimated 5,000 new counselors completed alcohol and drug abuse training.

The majority of training for counselors is delivered by associations and at conferences. It was estimated that a typical day of alcohol and drug abuse counseling training or conference attendance includes about 6 contact hours. It is also estimated that the cost for a training day is about $100. This estimate is based on the cost of attending the National Association of Alcoholism and Drug Abuse Counselors conferences, although the actual costs of training provided through educational institutions could be higher than $100 per day. Although counselors may pay less than $100 per day out of their own pockets, the actual cost for publicly provided or publicly subsidized training is still estimated to be no less than $100 per day. At an average of 6 contact hours per day of training, the cost per contact hour is $16.67.

The cost of training new alcohol and drug abuse counselors is therefore estimated to be $12.5 million.[3] Moreover, it is estimated that $29 million was spent training the 58,000 existing counselors (approximately $500 per person per year is spent on training and continuing education for existing alcohol and drug abuse counselors, who receive a minimum of 30 hours per year of training).

The cost and quantity of training provided to other professionals who work in alcohol and drug abuse treatment programs were estimated using Harwood and Salinsky (1994) and NDATUS data (Substance Abuse and Mental Health Services Administration [SAMHSA] 1993a). Other professionals receiving training in alcohol and drug abuse include psychiatrists, other physicians, registered nurses, other medical personnel, psychologists, social workers, occupational therapists, and employee assistance counselors. Estimates of the number of staff in alcohol and drug abuse treatment units were adjusted upward by 28 percent to account for nonresponse in program staffing data in the 1991 NDATUS.

An estimated 65,900 other professionals in alcohol and drug abuse settings receive about 20 percent (6 hours) of the 30 CEU hours per year required of alcohol and drug abuse counselors within specialized alcohol and drug abuse treatment units. The extent to which alcohol and drug abuse training is incorporated into the continuing education activities of other professionals working in alcohol and drug abuse treatment settings is unclear. For professionals other than alcohol and drug abuse counselors working in alcohol and drug abuse treatment settings, the level of alcohol and drug abuse counseling training is very low. For social workers and psychiatrists, the extent of the training received specifically on alcohol and drug abuse topics is unknown. Although many psychology training programs offer some type of course(s) related to alcohol and drug abuse, how much these opportunities are utilized by students is not clear.

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[3] This is the product of 5,000 new counselors x 60 percent who receive training x 250 hours of training x $16.67 per hour.

It is assumed that on average, the 994,400 mental health professionals not working in alcohol and drug abuse treatment settings receive about 2 hours of alcohol and drug abuse training per year. Although mental health professionals receive 25 to 30 hours of training each year in their profession, alcohol and drug abuse is a small part of the curriculum and training. These professionals include psychiatrists, psychiatric nurses, psychologists, social workers, and professional counselors (master's degree and above) (Manderscheid and Sonnenschein 1992).

On average, an estimated 2.8 million other health professionals receive about 0.5 hours of alcohol and drug abuse-related training per year. Other health professionals not working in alcohol and drug abuse treatment settings receive even less alcohol and drug abuse-related training than mental health professionals not working in alcohol and drug abuse treatment settings. Other health professionals not working in alcohol and drug abuse treatment settings include nurses (registered nurses, licensed practical nurses, vocational nurses, and registered nurses), physicians (family practice/general practice, internal medicine, pediatricians, obstetricians/gynecologists, preventive medicine, emergency medicine, and other physicians), pharmacists, physician assistants, occupational therapists, and physical therapists (Harwood and Salinsky 1994).

Alcohol and drug abuse-related training are not major parts of professional development for the 1.7 million law enforcement professionals and 340,000 clergy; therefore, it is assumed that those professionals receive, on average, 0.5 hours of training per year. Although most law enforcement/criminal justice professionals encounter alcohol and drug abuse on a daily basis in their professions, they receive relatively little professional training in alcohol and drug abuse topics. Criminal justice/law enforcement professionals include law enforcement officers, judges, prosecutors, corrections officers, probation/parole officers, and public defenders. Statistics for the number of criminal justice/law enforcement professionals were obtained from Bureau of Justice Statistics data (U.S. Department of Justice 1994g). Finally, it is estimated that on average, clergy—pastoral counselors such as ministers, pastors, priests, and others—receive 0.5 hours of training per year (Harwood and Salinsky 1994).

All costs for training are allocated to either alcohol or drug abuse, based on the estimated primary problems faced by patients entering the non-Federal treatment system (discussed in section 4.2.1).

4.2.3.2 Research and Administrative Support

In 1992, Federal sources spent about $536 million on research and development, and public and private insurance agencies spent about $325 million for administration of specialty treatment insurance benefits.

During 1992, the Federal Government spent $157.5 million for drug abuse prevention research and $194.5 million for drug abuse treatment research through the National Institute on Drug Abuse (NIDA) (ONDCP 1995). Moreover, the Federal Government spent $184 million for research into the prevention and treatment of alcohol abuse through the National Institute on Alcohol Abuse and Alcoholism (NIAAA) (separate estimates of prevention and treatment were not available) (Office of Management and Budget 1993). Spending for basic and applied research supported by NIDA and NIAAA are included in these amounts.

In addition, expenditures on community-based treatment reported previously reflect only the amounts received by treatment providers. Private and public insurance programs and State and county administrative agencies also incur costs in reimbursing services and administering programs. The U.S. Public Health Service has estimated that approximately 4.8 percent of total health expenditures in the United States in 1992 went to the administration of private and public insurance programs (Levit et al. 1996). Therefore, it is estimated that $325 million[4] was spent on insurance administration for community-based treatment, of which $195.7 million is allocated to alcohol abuse treatment and $129.4 is allocated to drug abuse treatment.

4.3 Medical Consequences

The cost of alcohol abuse-caused illness treated in hospitals in 1992 is estimated to be about $5.9 billion. Costs for hospital treatment of drug abuse-caused illness are estimated at only $572 million because of a lack of data to attribute specific health consequences to drug abuse.

4.3.1 Hospital Costs

4.3.1.1 Introduction

Alcohol and drug abuse problems have been targeted as an important and growing source of hospital-based medical care and expenditures. There are primarily three ways in which alcohol and drug abuse are seen in hospitals:

- Direct and specific consequences of alcohol or drug abuse, such as psychoses, withdrawal, or poisoning, may necessitate hospitalization.
- Alcohol or drug abuse may contribute to other illnesses or injuries that require treatment.
- Alcohol or drug abuse may complicate treatment of other illnesses or injuries, perhaps resulting in longer lengths of stay in the hospital.

Each of these results in distinctly different costs. To the degree that data are available for each, each is counted in this study.

This report relies on the two estimation methodologies employed in the prior studies of the impact of alcohol and drug abuse on hospital care. The first approach is termed the diagnosed population (DP) approach used by Rice et al. (1990), and the second is the illness-specific (IS) approach used in the two previous Research Triangle Institute studies (Cruze et al. 1981; Harwood et al. 1984).

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[4] 5.04 percent [4.8%/(100%–4.8%)] is applied to the $6.4 billion spent on community-based treatment.

Both approaches count hospitalization days that result directly and specifically from alcohol and drug abuse—that is, they count all days for which the primary diagnosis was an alcohol or drug abuse-specific diagnosis (e.g., psychosis, withdrawal, and poisoning). Where the two approaches differ is in their estimation of indirect hospital days attributable to alcohol and drug abuse.

- **Diagnosed-Population Approach.** The diagnosed population (DP) approach suggests that alcohol and drug abuse problems complicate treatment for certain conditions, resulting in longer lengths of stay for persons with a secondary alcohol or drug abuse disorder than for persons with no secondary alcohol or drug abuse disorder.

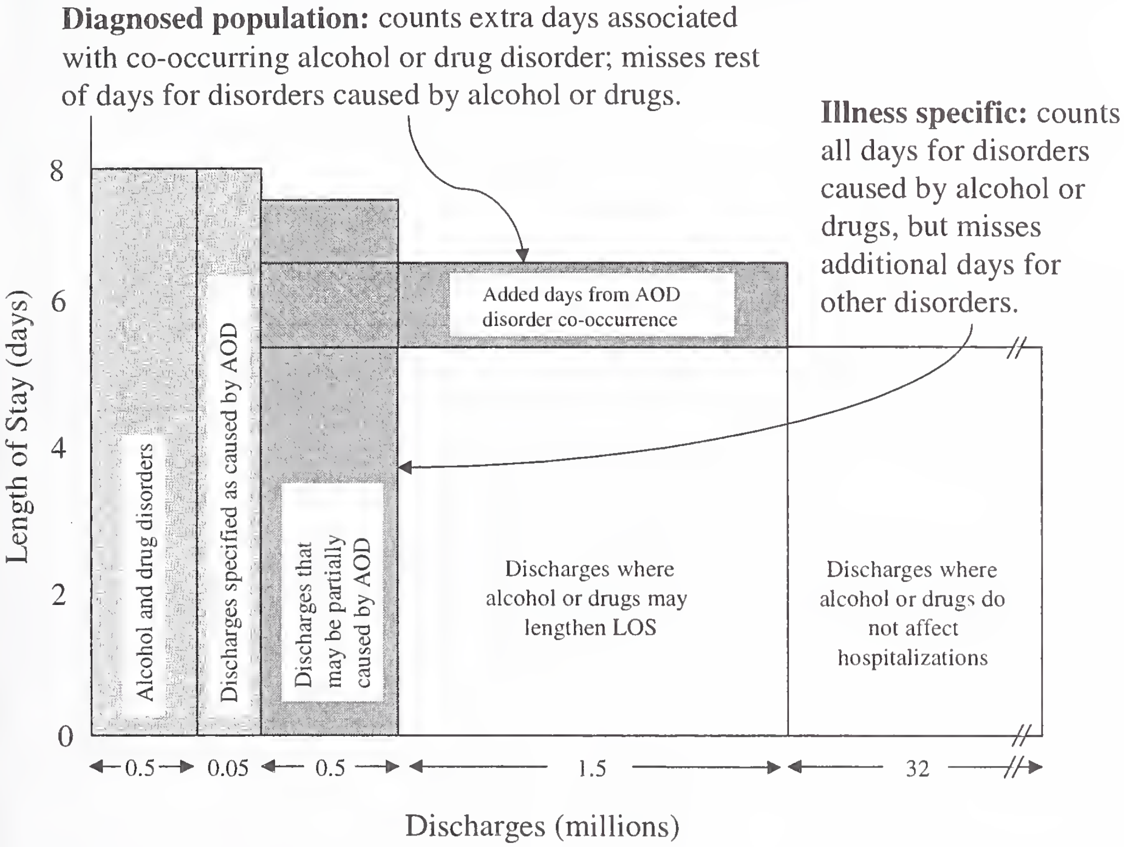
- **Illness-Specific Approach.** The illness-specific (IS) approach is predicated on the evidence that certain health conditions (e.g., forms of cirrhosis) are caused by alcohol and drug abuse, and accordingly, some proportion of the total hospitalizations for conditions that are partially caused by alcohol and drug abuse ought to be attributed to alcohol and drug abuse problems.

Both approaches offer insights and have limitations regarding alcohol and drug abuse-related hospitalizations. The IS approach relies on prior research that has established a causal link between alcohol or drug abuse and illnesses and injuries. To date, the most extensive research available estimates the percentage of mortalities attributable to alcohol by diagnostic category (Stinson et al. 1993). For example, 75 percent of mortalities from malignant neoplasms of the esophagus are attributable to alcohol abuse. Applying the mortality data to morbidity allows us to allocate a share of all health expenditures for each relevant diagnostic category. By inference then, 75 percent of hospitalizations for malignant neoplasms of the esophagus also may be allocated to alcohol abuse. Using mortality-based attribution factors to estimate the extent of morbidity attributable to alcohol consumption generates a conservative bias. This approach will systematically exclude any nonfatal conditions caused by alcohol and will tend to understate the incidence of alcohol-caused conditions that are not always fatal. An additional source of conservative bias associated with the IS approach is that it is limited to the causal research available—the role of alcohol in mortality has been well studied, but the role of drug abuse has not.

The DP approach includes all diagnostic categories and is not constrained by availability of estimates concerning the degree to which alcohol and drug abuse causes other health problems. However, several health conditions have been found to be at least partially caused by alcohol and drug abuse, such that a fraction of *all* treatment days for those conditions can be attributed to alcohol and drug abuse. The DP approach only calculates the additional days associated with a co-occurring alcohol or drug abuse disorder.

The results of the DP approach are largely complementary to the IS approach, however, and this report combines both approaches in the final estimate of costs. Figure 4.1 demonstrates this logic in graphic form. The vertical axis shows length of stay; the horizontal axis shows the number of discharges. The first two columns, treatment for alcohol and drug problems and illnesses specifically caused by alcohol or drug abuse, are fully counted in the IS and DP approaches and are counted in this report (accounting for a little more than 0.5 million discharges). The third column includes disorders partially caused by alcohol or drug abuse (again, about 0.5 million discharges), for which the IS approach counts the proportion of discharges and days (slashes on the left side of the column). Under the DP approach, additional days are calculated for all discharges where alcohol or drug abuse is listed as a secondary diagnosis. This includes more than 2 million discharges, of which 0.5 million are the same as those used in the IS approach. The final column, on the right, represents another 32 million discharges in 1992, none of whom were hospitalized for conditions related to alcohol or drug abuse.

Figure 4.1
Graphic Depiction of Illness-Specific and Diagnosed-Population Approaches



Diagnosed population: counts extra days associated with co-occurring alcohol or drug disorder; misses rest of days for disorders caused by alcohol or drugs.

Illness specific: counts all days for disorders caused by alcohol or drugs, but misses additional days for other disorders.

Length of Stay (days)
8
6
4
2
0
Alcohol and drug disorders
Discharges specified as caused by AOD
Discharges that may be partially caused by AOD
Added days from AOD disorder co-occurrence
Discharges where alcohol or drugs may lengthen LOS
Discharges where alcohol or drugs do not affect hospitalizations
0.5
0.05
0.5
1.5
32
Discharges (millions)

AOD = alcohol or drug.
LOS = length of stay.
NOTE: All shaded areas are estimated in this study.

4.3.1.2 Analysis of Hospital Days Under Alternative Approaches

Analyses were conducted using the National Center for Health Statistics' 1990, 1991, and 1992 National Hospital Discharge Survey (NHDS), including data for newborns. The NHDS reports the number of inpatients discharged and days of care for short-stay, non-Federal hospitals by primary and secondary diagnosis as catalogued in the International Classification of Diseases (ICD). A complete list of the ICD version 9 (ICD-9) codes is included in Appendix A.

4.3.1.2.1 Hospital-Based Alcohol and Drug Abuse Treatment

Both the DP and IS approaches estimate the number of days of alcohol and/or drug abuse-specific treatment provided in hospital settings. It is estimated that in 1992, there were more than 524,000 discharges where the treatment provided was primarily for an alcohol or drug abuse diagnosis (see table 4.6). Almost 4.2 million days of care were delivered, of which 65 percent were for alcohol and 35 percent were for drug abuse diagnoses. An episode of hospital-based treatment averaged 8.4 days for primary alcohol diagnoses and 7.3 days for primary drug abuse diagnoses. Most of these hospital treatment episodes were probably short-term detoxification episodes, and a single alcohol or drug abuser could have had more than one, and possibly many, such episodes. The costs for hospital-based care were estimated separately by Harwood et al. (1994) and are discussed in section 4.1.

Table 4.6

Hospital Episodes Primarily for Alcohol or Drug Abuse Disorders, 1992

Alcohol and Drug Abuse Disorders Requiring Hospitalization	ICD-9 Code	Discharges	Days	Average LOS* in days
Primary Alcohol Episodes				
Alcohol psychoses	291	47,895	290,831	6.07
Alcohol dependence	303	241,645	2,314,599	9.58
Nondependent abuse of alcohol	305.0	26,885	91,847	3.42
Toxic effects of ethyl alcohol	980.0	4,388	10,129	2.31
Total, Alcohol Abuse		***320,813***	***2,707,406***	***8.44***
Primary Drug Abuse Episodes				
Drug psychoses	292.0	14,679	118,599	8.08
Drug dependence	304.0	92,850	986,364	10.62
Nondependent abuse of drugs	305.2 305.9	20,439	146,256	7.16
Poisoning by opiates and related narcotics	965.0	5,233	20,506	3.92
Poisoning by sedatives and hypnotics	967	7,452	22,335	3.00
Poisoning by central nervous system muscle tone depressants	968	2,102	3,639	1.73
Poisoning by psychotropic agents	969	57,893	171,300	2.96
Poisoning by central nervous system stimulants	970	2,968	10,176	3.43
Total, Drug Abuse		***203,616***	***1,479,175***	***7.26***
TOTAL		**524,429**	**4,186,581**	**7.98**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

*LOS = length of stay.

4.3.1.2.2 Treatment for Conditions Specifically Caused by Alcohol or Drug Abuse

Some illnesses are definitionally and specifically caused by alcohol or drug abuse (e.g., alcoholic cardiomyopathy), where the role of alcohol or drugs was defined by the diagnosticians at the time that a patient was treated. For these cases, all admissions and discharges are allocated to either alcohol or drug abuse as appropriate. It is estimated that there were about 50,000 discharges in 1992 for illnesses that are specifically caused by alcohol abuse, resulting in about 410,000 days of care. It is also estimated that there were fewer than 1,000 discharges for drug abuse disorders, resulting in about 6,000 days of care. These estimates are unreliable, however, because of the small cell sizes in the survey.

Medical treatment for fetal alcohol syndrome and other effects of drug exposure on the fetus or newborn are discussed in depth under special disease groups later in this chapter. As a result, values from table 4.7 for these diagnoses are not included in the total hospital costs associated with alcohol or drug abuse.

Table 4.7

Hospital Episodes for Disorders Specifically Caused by Alcohol and Drug Abuse

Disorders Specifically Caused by Alcohol and Drug Abuse	ICD-9 Code	Discharges (thousands)	Days (thousands)	Average Length of Stay (days)
Alcohol Specific				
Alcoholic polyneuropathy	357.5	0.2	3.2	13.4
Alcoholic cardiomyopathy	425.5	2.4	17.8	7.3
Alcoholic gastritis	535.3	9.4	34.7	3.7
Alcoholic cirrhosis	571.0–571.3	38.2	353.0	9.2
Fetal alcohol syndrome (FAS)	760.71	0.1	0.7	9.7
Total, Alcohol Specific		*50.3*	*409.5*	*8.1*
Total, Alcohol Specific (without FAS)		**50.2**	**408.8**	**8.1**
Drug Specific				
Polyneuropathy due to drugs	357.6	0.3	1.0	3.4
Narcotics affecting fetus or newborn via placenta or breast	760.72	0.1	0.5	3.4
Hallucinogens affecting fetus or newborn via placenta or breast	760.73	0.2	3.8	21.0
Drug withdrawal syndrome in newborns	779.5	0.1	1.0	6.9
Total, Drug Abuse Specific		*0.7*	*6.3*	*9.0*
Total, Drug Abuse Specific (not including effects on newborn/fetus)		**0.3**	**1.0**	**3.4**

NOTE: Components may not sum to totals because of rounding.

4.3.1.2.3 Additional Hospital Days Using Diagnosed-Population Approach

The number of additional hospital days that result from co-occurring alcohol and drug abuse disorders was calculated by comparing lengths of stay and applying the additional length of stay to the number of discharges found among persons with a co-occurring alcohol or drug abuse disorder. To accomplish this, we first excluded discharges for primary diagnoses of alcohol or drug abuse disorders (see the previous section for a discussion of treatment for alcohol or drug abuse problems in the hospital). Second, we segmented the remaining discharges into four groups: (1) patients who had no co-occurring alcohol or drug abuse disorder, (2) patients who had an alcohol but no drug disorder, (3) patients who had a drug but no alcohol disorder, and (4) patients who had both an alcohol and drug disorder.

The lengths of stay for persons with no alcohol or drug disorder diagnosis were subtracted from the lengths of stay for persons with alcohol, drug, or combined alcohol and drug disorders listed as a secondary diagnosis. The result of the subtraction is the estimated additional days per episode resulting from a co-occurring alcohol or drug disorder. The additional days per episode were then multiplied by the number of discharges for each group with a co-occurring alcohol or drug disorder to obtain total additional days of care.

Table 4.8 shows the number of patient discharges, days of care, and average length of stays, distributed by major diagnostic categories, for the four groups previously discussed. The vast majority of discharges (94.1 percent) did not have any secondary alcohol or drug abuse diagnosis, and 92.1 percent of the total days of care were delivered to persons with no secondary alcohol or drug abuse diagnosis. Out of 34.4 million discharges from hospitals, 2.0 million had a secondary (but no primary) diagnosis of alcohol and drug abuse. Of those, 1.1 million had a secondary alcohol abuse diagnosis, 770,000 had a secondary drug abuse diagnosis, and 140,000 had secondary diagnoses of *both* alcohol and drug abuse. Rice et al.'s (1990) previous estimations of hospital-related stays included mental illness (and alcohol and drug abuse) as a category for analysis of psychiatric and alcohol and drug abuse comorbidity. The present report analyzes costs from psychiatric comorbidity separately below, and this category is not included in the table.

As expected, lengths of stay were longer for patients with co-occurring alcohol and drug problems (7.7 days) compared with stays for other patients (5.6 days). In some disease categories, lengths of stay with a recorded co-occurring alcohol and drug abuse disorder were twice as long as those among noncomorbid patients. However, there were two categories for which length of stay was not longer among comorbid patients. First, lengths of stay for endocrine, nutritional, and metabolic disorders were slightly lower among comorbid than among noncomorbid patients. Second, lengths of stay for patients with injuries and poisoning were lower among comorbid patients than among noncomorbid patients. Additional research should examine whether injuries and poisonings among persons with an alcohol or drug abuse comorbidity are more serious and more likely to result in death, which would explain the shorter lengths of stay. Finally, comorbid patients with digestive problems accounted for more additional days of care (628,000) than any other category.

Table 4.8

Alcohol and Drug Abuse-Related Additional Days of Hospital Care, 1992

Diagnostic Category	No Alcohol or Drug Abuse Comorbidity			Alcohol Abuse Comorbidity				Drug Abuse Comorbidity				Both Alcohol and Drug Abuse Comorbidity			
	Disch. (000's)	Days (000's)	LOS*	Disch. (000's)	Days (000's)	LOS*	*Add. Days (000's)*	Disch. (000's)	Days (000's)	LOS*	*Add. Days (000's)*	Disch. (000's)	Days (000's)	LOS*	*Add. Days (000's)*
Infect./Parasit.	676	5,953	8.8	23	266	11.8	*67*	39	621	15.9	*278*	6	103	17.0	*50*
Neoplasm	1,775	15,070	8.5	37	490	13.3	*176*	23	233	10.0	*36*	2	15	7.7	*(2)*
Endoc./Nutrit.	1,072	7,371	6.9	88	575	6.5	*(32)*	31	198	6.3	*(17)*	6	35	6.2	*(4)*
Blood	297	1,817	6.1	16	125	8.0	*30*	10	64	6.2	*1*	1	8	8.7	*3*
Nervous	647	3,652	5.6	28	284	10.1	*125*	29	184	6.3	*20*	10	64	6.5	*8*
Circulatory	5,069	36,999	7.3	209	1,622	7.8	*95*	92	788	8.6	*119*	19	166	8.7	*27*
Respiratory	2,706	18,859	7.0	111	979	8.8	*205*	81	760	9.4	*194*	15	107	7.4	*6*
Digestive	2,821	16,825	6.0	268	2,120	7.9	*523*	49	345	7.1	*56*	19	159	8.6	*49*
Genitourinary	1,818	9,244	5.1	29	194	6.7	*47*	28	192	6.9	*51*	2	18	8.1	*7*
Pregnancy	4,606	12,317	2.7	8	70	8.8	*48*	96	323	3.4	*67*	9	45	5.2	*22*
Skin	391	3,354	8.6	21	213	10.2	*33*	38	253	6.6	*(75)*	5	37	7.3	*(7)*
Musc./Skel.	1,485	9,566	6.4	22	202	9.0	*57*	22	241	11.2	*102*	1	10	7.2	*1*
Injury/Poison	2,361	16,539	7.0	243	1,666	6.9	*(35)*	187	935	5.0	*(376)*	45	216	4.9	*(96)*
Supplemental	4,188	15,039	3.6	11	130	11.4	*89*	40	491	12.4	*349*	1	10	7.2	*5*
Other	2,469	10,007	4.1	1	11	18.7	*7*	5	66	12.2	*25*				
TOTAL	**32,380**	**182,612**	**5.6**	**1,114**	**8,945**	**8.0**	***1,434.9***	**770**	**5,696**	**7.4**	***828.6***	**140**	**993**	**7.1**	***69***

SOURCE: Analysis of the 1990–1992 National Hospital Discharge Survey by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

*LOS = Length of stay (average) in days.

Because of the extremely large sample sizes, it is expected—but not established—that the substantial differences in length of stay between populations are statistically significant. Future assessments of the additional days of hospital care resulting from co-occurring alcohol and drug abuse disorders would benefit from a more comprehensive analysis that includes other factors that could explain variation in length of stay. For example, age, sex, and sociodemographic status may covary with alcohol and drug abuse and explain part of the additional length of stay observed here (e.g., see Bradley and Zarkin 1996).

4.3.1.2.4 Alcohol and Drug Abuse-Specific Hospital Episodes Using the Illness-Specific Approach

As discussed above, considerable research evidence has accumulated concerning the unique contribution of alcohol to illnesses and injuries that result in death (Stinson et al. 1993).[5] For other conditions (e.g., cirrhosis), a proportion of the cases are caused by alcohol abuse. Research evidence is available regarding the proportion of mortalities related to alcohol consumption. It is assumed here that for any given illness or injury partially caused by alcohol, the proportion of hospitalizations caused by alcohol is equal to the proportion of deaths from that diagnosis that is caused by alcohol. This assumption will tend to understate the role of alcohol in causing hospitalizations because the data on the role of alcohol in mortality from various causes do not reflect alcohol's role in causing nonfatal conditions and understate the role of alcohol in causing diseases that are not always the ultimate cause of death. Despite this bias, the IS approach is the best available technique for estimating the role of alcohol in causing various illnesses and injuries. Unfortunately, similar evidence is not available for a variety of drug abuse-caused illnesses. Table 4.9 shows the number of discharges related to alcohol and drug abuse calculated using the IS approach.

Using the IS approach, it is estimated that more than 511,000 hospital discharges in 1992 were for illnesses or injuries caused by alcohol abuse, for a total of just under 4.0 million days of hospital care. Some conditions that are caused in part by alcohol use (e.g., 75 percent of malignant neoplasms of the esophagus) nonetheless had relatively few discharges. On the other hand, whereas only 10 percent of fractures were estimated to have been caused by alcohol use, the fact that there were many hospitalizations for fractures means that fractures accounted for almost 20 percent of the alcohol-related discharges and 20 percent of alcohol-related days of care.

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[5] A point of departure from the mortality estimates attributed to alcohol by Stinson et al. (1993) is that this study attributes 10 percent of nonfatal accidents and injuries to alcohol. Stinson's research concludes that alcohol caused 16 to 46 percent of certain accidents and injuries in which the victims died before admission to a hospital. This study attributes 10 percent of all nonfatal accidents and injuries that result in hospitalization or outpatient care to alcohol.

Table 4.9

Hospitalizations for Illnesses Partly Caused by Alcohol, 1992

Illness Partly Caused by Alcohol	ICD-9 Code	Attributable Fraction (%)	Attributable Discharges (thousands)	Attributable Days (thousands)	LOS (days)
Respiratory tuberculosis	011-012	25%	4.0	61.5	15.4
Malignant neoplasm of lip, oral cavity, and pharynx	140-149	50 (men) 40 (women)	12.2	105.5	8.7
Malignant neoplasm of esophagus	150	75%	13.9	175.8	12.6
Malignant neoplasm of stomach	151	20%	4.8	65.8	13.7
Malignant neoplasm of liver and interhepatic bile ducts	155	15%	1.6	19.1	12.0
Malignant neoplasm of larynx	161	50 (men) 40 (women)	5.4	83.4	15.4
Diabetes mellitus	250	5%	22.1	160.0	7.2
Essential hypertension	401	8%	14.1	54.7	3.9
Cerebrovascular disease	430-438	7%	55.0	519.1	9.4
Pneumonia and influenza	480-487	5%	50.6	430.1	8.5
Diseases of esophagus, stomach, duod.	530-537	10%	58.2	335.5	5.8
Chronic hepatitis	571.4	50%	2.0	12.0	5.9
Cirrhosis of liver, alco. not mentioned	571.5	50%	9.5	100.7	10.6
Oth. chronic nonalcohol. liver damage	571.8	50%	0.7	4.5	6.7
Unspec. chronic liver disease, no mention of alcohol	571.9	50%	0.3	3.3	11.2
Portal hypertension	572.3	50%	1.3	12.5	9.3
Acute pancreatitis	577.0	42%	48.4	415.2	8.6
Chronic pancreatitis	577.1	60%	9.7	103.2	10.6
Fractures	800-829	10%	97.5	812.8	8.3
Dislocations	830-839	10%	5.2	16.6	3.2
Sprains and strains	840-848	10%	13.3	47.5	3.6
Intracranial	850-854	10%	16.6	94.8	5.7
Thorax, abdomen, pelvis	860-869	10%	8.4	70.7	8.5
Open wound—head, neck, trunk	870-879	10%	8.5	31.3	3.7
Open wound—upper limb	880-887	10%	5.7	25.9	4.5
Open wound—lower limb	890-897	10%	3.3	17.5	5.4
Injury to blood vessels	900-904	10%	1.0	7.5	7.6
Late effects	905-909	10%	0.7	7.4	11.3
Superficial	910-919	10%	0.9	2.8	3.0
Contusions	920-924	10%	7.1	32.8	4.6
Crushing	925-929	10%	0.6	3.7	6.5
Foreign bodies	930-939	10%	2.1	7.6	3.7
Burns	940-949	10%	5.0	56.8	11.3
Nerves and spinal	950-957	10%	1.0	8.4	8.5
Trauma, comp.	958-959	10%	2.6	13.7	5.3
Poisoning	960-968	10%	6.2	19.5	3.2
Poisoning	971-979	10%	3.3	10.4	3.1
Toxic effects	980-989	10%	3.4	11.0	3.2
Other external	990-995	10%	5.3	24.7	4.7
TOTAL, ALCOHOL-RELATED			**511.5**	**3,985.3**	**7.8**

NOTE: Components may not sum to totals because of rounding.

4.3.1.2.5 Discussion of the Differences Between Diagnosed-Population and Illness-Specific Approaches

Both the DP and IS approaches include the days of care for the treatment of alcohol and drug abuse disorders as well as disorders that are specifically and directly caused by alcohol and drug abuse. In all, this represents 3.1 million days of care for alcohol abuse and about 1.5 million days of care for drug abuse.

Where the IS and DP approaches differ, however, is in their respective assumptions about the contribution of alcohol or drug abuse to other illnesses and injuries treated in hospitals. The DP approach calculates that about 2.3 million additional days of care were brought about as a result of the co-occurrence of alcohol or drug disorders. The IS approach calculates that about 4.0 million days of care were brought about for the treatment of disorders that are partially caused by alcohol abuse (similar causal factors are not available for drug abuse).

Both approaches have substantial advantages and disadvantages. The IS approach relies on a rigorously conducted and reviewed body of research to determine the days of care attributed to alcohol abuse. All of the costs of care for patients whose diseases have been caused by alcohol or drug abuse are counted with the IS approach, whereas only the additional days of care associated with co-occurring alcohol and drug abuse disorders are counted with the DP approach. The DP approach therefore stands to underrepresent the cost of alcohol and drug abuse-induced illness by a wider margin than does the IS approach. However, there are methodological and other limits associated with applying "cause" as required by the IS approach (see discussion in chapter 3). Moreover, similar data on the causal role of drug abuse in morbidity are not yet available.

The DP approach does capture the full array of diagnostic categories, not just those for which specific research on alcohol and drug abuse causality has been reported. Additionally, the fundamental argument that alcohol and drug abuse complicates treatment of other conditions is compelling. The DP approach ought to be extended with multivariate analyses, which would allow for modeling of additional days caused by alcohol or drug abuse, holding constant the effects of other factors such as age, gender, and income. However, the DP approach relies heavily on care providers to accurately document secondary alcohol or drug abuse conditions. Moreover, the DP approach misses cases where alcohol or drug abuse was a cause but for which alcohol or drug abuse would never be diagnosed—such as an individual who does not abuse alcohol but who is injured in an alcohol-related crash.

4.3.1.3 Estimating Costs

The DP and IS approaches are not mutually exclusive and, in fact, are complementary. By removing the diagnoses that are caused by alcohol abuse and drug abuse from the DP approach, the resulting additional days can be directly added to the illness-specific days. The result is an estimated total of 10 million days of care provided in hospitals as a consequence of alcohol and/or drug abuse (see table 4.10). Of those days, about 5.3 million days are for the treatment of illnesses resulting from alcohol problems or for longer lengths of stay associated with co-occurring alcohol disorders. Approximately 0.5 million (512,000) days of care are associated with longer lengths of stay brought about by a co-occurring drug disorder, plus a small number of days attributed to drug-caused illnesses.

Table 4.10

Non-Federal Hospital Days and Associated Costs Resulting From Alcohol and Drug Abuse, 1992

	Days of Care (thousands)	Costs (millions)
Alcohol		
Alcohol-specific illnesses	409	\$414
Alcohol-related illnesses	3,985	\$4,033
Additional days from co-occurring alcohol disorders[1]	871	\$881
Subtotal, Alcohol	*5,265*	*\$5,328*
Drug Abuse		
Drug abuse-specific illnesses	1	\$1
Drug abuse-related illnesses	*	*
Additional days from drug disorders[1]	511	\$517
Subtotal, Drug Abuse	*512*	*\$518*
TOTAL, Alcohol and Drug Abuse-Caused Illness and Days	**5,777**	**\$5,846**
Treatment of Alcohol and Drug Abuse Disorders		
Alcohol disorder treatment	2,707	\$973[2]
Drug disorder treatment	1,479	\$649[2]
Subtotal, Alcohol and Drug Disorder Treatment	*4,186*	*\$1,622*
TOTAL, Alcohol and Drug Abuse Hospital Cost and Days	**9,963**	**\$7,468**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

[1] Calculations of additional days resulting from alcohol abuse disorders exclude the days of care for alcohol-related illnesses in order to avoid double counting. For drug abuse, the proportion of discharges for which the additional days are calculated is assumed to be the same as for alcohol. Additional days from combined alcohol and drug abuse disorders are evenly split between alcohol and drug abuse. These values exclude effects on newborns, which are discussed more fully under special disease groups.

[2] The average cost per day for regular acute hospitalization, \$1,012, is discussed below. Analysis of NDATUS presented in section 4.2 suggests that the cost per day for the treatment of alcohol and drug disorders on average ranges from \$340 to \$440, depending on sources of revenue. Because the days of care listed here are comparable to those found from analysis of NDATUS, the costs for hospital-based treatment presented in table 4.3 are also presented here.

*These costs are estimated in section 4.4, "Special Disease Groups."

The average cost per day of hospital care in 1992 was estimated to be \$1,012 for care provided in short-term, non-Federal hospitals. This includes the costs incurred by the hospital and by independent physicians. The hospital per diem, \$816, is based on reported expenditures among American Hospital Association members for 1992 (American Hospital Association 1993). The cost per inpatient day for outside physician services is estimated to be $196 and is derived by dividing total physician office receipts for inpatient care by the total inpatient hospital days in the United States in 1992.[6] Applying the average cost per day to the number of hospital days associated with alcohol or drug abuse results in an estimated $5.3 billion for alcohol problems and $518 million for drug abuse problems.

4.3.2 Veterans Affairs and Other Federal Hospitals

No data are available concerning treatment provided in Veterans Affairs and other Federal hospitals of the medical consequences of alcohol and drug abuse. It is therefore assumed that the relative proportion of costs incurred as a result of treating the health consequences of alcohol or drug abuse in non-Federal hospitals also applies to Veterans Affairs and other Federal hospitals. Veterans Affairs and other Federal hospital revenues compose 9.5 percent of total hospital revenues in the United States (Levit et al. 1996). Using this, we can estimate the amount spent in hospitals by multiplying the non-Federal hospital costs attributed to alcohol and drug abuse (5,777 days at $816 per day) by the appropriate factor.[7] The result is an estimated cost of $495 in Federal, short-stay hospital costs, of which $451 million and $44 million are allocated to alcohol and drug abuse, respectively. Further research into the impact of alcohol on the Veterans Affairs and other Federal hospital systems is needed: It is altogether possible that there is a higher incidence of alcohol- and drug-related illness and injury seen in settings that treat veterans compared with the incidence in general acute care settings.

4.3.3 Outpatient Medical Care

Outpatient medical care for alcohol abuse-specific and alcohol abuse-related conditions cost approximately $1.75 billion during 1992.

Alcohol and drug abusers seek help from outpatient medical care providers for alcohol and drug abuse-specific and alcohol and drug abuse-related disorders. To estimate this, the IS approach used in the previous section was also applied to data on outpatient medical care utilization from the annual National Ambulatory Medical Care Survey. The DP approach that was also discussed in the previous section is not appropriate for this data source: NAMCS is, in effect, a survey of outpatient visits that are not longitudinally connected. It is impossible to determine whether persons with a comorbid alcohol and drug abuse problem use more or less outpatient services than persons with no comorbidity. Data for 1990 were analyzed, and the same causal factors employed in the hospital analysis above were used here. The findings are shown in table 4.11.

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[6] The $196 per inpatient day was calculated as follows: Physician receipts in taxable physician offices for inpatient services were inflated to reflect all physician services ($175.7 billion / $141.4 billion from Levit et al. [1996]). The resulting amount, $39.5 billion, was divided by total hospital days, including newborns in the United States in 1992 (201.7 million, NCHS [1995]). Note that some researchers have argued for including an additional "physician visit" to the cost of a hospital episode, since there is usually either a preadmission visit or a followup visit. However, this study assumes that any noninpatient visits associated with a hospital episode are reported in the National Ambulatory Medical Care Survey.

[7] The imputation factor of 10.5 percent was calculated as 100 percent / (1–9.5 percent).

Alcohol and drug abuse treatment service visits are shown, but their cost is included as part of the discussion on specialty alcohol and drug abuse treatment in section 4.2.

It is estimated that about 10.5 million visits were made to outpatient medical care providers for alcohol and drug abuse-specific or alcohol and drug abuse-caused problems, other than primary treatment for the alcohol and drug abuse itself. These visits were for alcohol-specific and alcohol-related disorders only. There were no ambulatory care visits in the data source for drug abuse-specific disorders (that is, disorders definitionally attributable to drug abuse). In addition, as noted earlier, there are no causal data with which to estimate drug abuse-caused disorders. Two-thirds of the outpatient medical services were provided by general practitioners, including family doctors and pediatricians, and about one-third were provided by "other" physicians, including specialists. We estimate the cost per physician visit to have been $166 in 1992.[8] Altogether, the 10.5 million outpatient visits for consequences attributed to alcohol and drug abuse cost about $1.7 billion.

Table 4.11

Costs of Outpatient Medical Care for Alcohol and Drug Abuse-Specific and Related Illnesses, 1992

Type of Medical Care	Visits (thousands)				Cost (millions)
	General	Psychiatry	Other	Total	
Alcohol abuse treatment	488	289	13	790	$131.1
Alcohol abuse specific	1,196	0	189	1,385	$229.9
Alcohol abuse related	5,815	11	3,325	9,151	$1,519.1
Total, Alcohol Abuse	*7,499*	*300*	*3,527*	*11,326*	*$1,880.1*
Drug abuse treatment	192	112	0	304	50.5
Drug abuse specific	0	0	0	0	0
Drug abuse related	*	*	*	*	*
Total, Drug Abuse	*192*	*112*	*0*	*304*	*$50.5*
Total, Alcohol and Drug Abuse	**7,691**	**412**	**3,527**	**11,630**	**$1,930.6**
TOTAL, Excluding Alcohol and Drug Abuse Treatment	**7,011**	**11**	**3,514**	**10,536**	**$1,749.0**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding. The bottom row of this table excludes treatment for drug and alcohol abuse disorders, which are reported in section 4.2.

*These costs are estimated in section 4.4, "Special Disease Groups."

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[8] The $166 was calculated as follows: Physician revenues for noninpatient services reported in Levit et al. (1996) were adjusted to include nontaxable, as well as taxable, organizations ($136.2 billion). This value was divided by the total visits to physician offices and outpatient service centers (818.6 million) derived from the National Ambulatory Medical Care Survey and the National Hospital Ambulatory Care Survey (NCHS 1995).

4.3.4 Nursing Homes

This study estimates that $623 million in nursing home costs can be attributed to alcohol abuse. Total nursing home expenditures in 1992 were $62.3 billion (NCHS 1995). Rice et al. (1990) attributed 2 percent of costs in 1985 to alcohol problems and none to drug abuse problems. Harwood et al. (1984) attributed 0.8 percent to alcohol and none to drugs. Rice's attribution factor included cases in which alcohol was a secondary as well as primary diagnosis. However, alcohol may not be the main factor underlying placement in nursing homes. The 1985 National Nursing Home Survey (NNHS) determined that 3.9 percent of nursing home residents have an alcohol or drug abuse problem (NCHS 1989, table A). Further analysis of NNHS suggests that 26 percent of the residents with an alcohol or drug abuse problem may in fact have a primary diagnosis of alcohol or drug abuse, which is 1.0 percent of the entire nursing home population.[9] Applying this estimate of 1.0 percent to the total national expenditures on nursing homes yields $623 million for alcohol and drug abuse combined. All of this is allocated to alcohol abuse.

4.3.5 Pharmaceuticals

National expenditures on drugs and medical nondurables were $71.2 billion in 1992 (Levit et al. 1996). This study assumes that the proportion of these expenditures that went for conditions related to or caused by alcohol abuse is comparable to the proportion of inpatient hospital days for illnesses that are caused in whole or in part by alcohol abuse. This is the approach used in the studies by Cruze et al. (1981) and Harwood et al. (1984). Accordingly, 2.2 percent[10] of the total national expenditure on drugs and medical nondurables, or about $1.57 billion, is allocated to alcohol abuse. Again, there is no equivalent basis for ascertaining a similar proportion for drug abuse; instead, pharmaceutical costs due to drug abuse are included in the discussion of specific diseases in this chapter.

4.3.6 Other Health Professionals

Total expenditures for other health professionals in the United States—such as dentists, midwives, and home health technicians—were $42.1 billion in 1992 (NCHS 1995). It is again assumed that 2.2 percent of this total, or $0.9 billion, was attributable to the medical consequences of alcohol. This may be a slight overestimate of the cost attributable to other health professionals, because some of the other health professionals include psychologists and social workers, whose costs have been estimated separately under the category for specialty alcohol and drug abuse treatment providers. However, psychologists and social workers represent only about $4.0 billion out of the $42.1 billion in expenditures for other health professionals (Harwood et al. 1994). Costs due to drug abuse are included in the discussion of specific diseases presented in this chapter.

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[9] 26 percent is derived by dividing the proportion of residents with a primary diagnosis of "other mental disorder" that includes alcohol and drug abuse disorders (1.4 percent) by the proportion of residents with *any* diagnosis of "other mental disorder" (5.4 percent) (NCHS 1989, tables 23 and 24).

[10] The total days for alcohol-caused illness (409+3985) divided by total days of care (198,246).

4.4 Special Disease Groups

Certain types of medical consequences of alcohol or drug abuse are underrepresented in the hospital and ambulatory care costs described in section 4.2. These include the full cost of treatment for fetal alcohol syndrome (FAS), psychiatric comorbidity, drug-exposed babies, HIV/AIDS, tuberculosis, and hepatitis.

4.4.1 Fetal Alcohol Syndrome

This study uses recent estimates that 2.0 per 1,000 live births have FAS and that it cost an estimated $1.9 billion in 1992 to treat infants, children, and surviving adults for FAS and its sequelae.

4.4.1.1 Synopsis

FAS is estimated to occur in 2.0 per 1,000 live births in the United States each year (Bloss 1995, personal communication). It is estimated that during 1992, the cost of treating FAS-affected infants, children, and adults was $1,944 million. Most of the cost associated with FAS treatment is incurred while developmentally disabled persons are either institutionalized or receiving intensive home-based services during their adult years. This estimate does not include other effects that result from fetal alcohol exposure that has not been diagnosed as FAS.

4.4.1.2 Fetal Alcohol Syndrome in the United States

FAS was first identified in the United States in 1973 (Jones and Smith 1973). The effects of fetal alcohol exposure range from morphological abnormalities to mental impairment. Abel and Sokol (1987) defined features of the syndrome to include growth deficiency; anomalies of brain structure and function, including intellectual deficits; and abnormalities of the head and face. Sokol and Clarren (1989) expanded this definition to include neurological abnormalities, developmental delays, and behavioral dysfunction. Sokol and Clarren also specified the facial abnormalities to be short eye openings; a thin upper lip; an elongated, flattened midface; and an indistinct groove in the middle of the upper lip. Streissguth et al. (1991) found that 58 percent of children born with FAS are later diagnosed as developmentally disabled.

Documenting the prevalence of FAS is very difficult. First, it is difficult for physicians to recognize features that define FAS and attribute them to a stigmatized disorder, rather than to other causes. Second, it may take time for FAS features to become apparent. For example, neurobehavioral and cognitive deficits may not become apparent for many years. Three methodological approaches have been used to estimate the incidence of FAS in the United States as follows:

- "Catchment" approach, where birth defects are monitored at the time of birth only;
- Review of retrospective studies, where children are identified as having FAS at some point after birth; and
- Review of prospective studies, where children are followed over time and assessed at various intervals from birth onward (Warren 1995).

Studies of babies (less than 1 year old) are necessary to document the impact of alcohol on the basal ganglia. Studies of older children (3 to 6 years old) are necessary because many of the features or symptoms of FAS (e.g., mental development) do not become manifest or diagnosable until that age (Warren 1995), whereas others, such as facial morphometric features, sometimes disappear.

The Centers for Disease Control and Prevention (CDC) used a catchment approach to arrive at an estimated FAS rate of 0.67 cases per 1,000 births in 1993, which was up from 0.22 per 1,000 births found in 1987. However, the CDC approach relied on documentation of ICD-9 diagnostic category 760.71, "noxious influences affecting fetus via placenta or breast milk, specifically alcohol; includes fetal alcohol syndrome." This category includes fetal alcohol *effects* as well as FAS. Moreover, the CDC study collected these data for newborns only. Finally, staff at the CDC Survey and Statistics Branch noted that physician diagnostic practices were not uniform and that increases in the reported incidence rate between 1987 and 1993 could have been partly due to better recognition, diagnosis, and awareness of FAS among physicians.

Researchers have used retrospective and prospective methodologies to estimate the incidence of FAS, to differing ends. Abel and Sokol's (1987) review of 19 retrospective and prospective epidemiological studies collected from around the world found that retrospective studies yielded a rate of 2.9 per 1,000 births, whereas prospective studies identified 1.1 per 1,000 births. On average, Abel and Sokol have concluded that FAS occurs in 1.9 per 1,000 births. Scientists, including NIAAA researchers, caution that retrospective and prospective studies may overestimate FAS incidence by oversampling populations in which FAS incidence is unusually high. When high-risk populations were removed, Abel and Sokol (1991a) found that only 0.33 per 1,000 births had FAS.

Some studies suggest that race/ethnicity is a factor in the incidence rate. Abel and Sokol (1987) reviewed one study that found 3.0 cases of FAS per 1,000 births among African-Americans in Cleveland; May et al. (1983) found 10 cases of FAS per 1,000 births among certain specific Native American subpopulations who were identified as "high risk" for socioeconomic reasons. It is also important to note that the calculation of the FAS incidence rate may be affected by an overstatement of the number of FAS cases in certain communities (e.g., Native Americans). This overstatement is in part due to a bias in diagnosis that occurs because of a lack of knowledge of the regular morphological features of Native Americans (Aase 1994). This "misdiagnosis" occurs because health professionals are not familiar with the similarities of non-FAS-affected Native American facial characteristics (particularly Native Americans from the Southwest) in comparison with facial characteristics typical of a Native American with FAS.

An Institute of Medicine report issued in 1996 (Stratton et al. 1996) concluded that the incidence rate of FAS falls between 0.5 and 3.0 per 1,000 in the general population, or 1 case per every 333 to 2,000 live births. Estimates of the costs associated with FAS used in this report are developed based on a conservative rate of 1 in 500 (2.0 per 1,000) live births, which is consistent with the Institute of Medicine findings. This also represents a midpoint in the range of estimates found by Abel and Sokol and is close to the 1.9 per 1,000 births that was previously reported. This rate may increase in coming years as more health professionals diagnose and record FAS cases (Warren 1995).

4.4.1.3 The Costs of Treating Fetal Alcohol Syndrome

4.4.1.3.1 Previous Studies

Previous studies have explored the costs of treating FAS. For example, Russell (1980) estimated the costs of treating FAS in New York State in 1978. Later studies expanded on Russell's work, including a Research Triangle Institute study in 1985 (Harwood and Napolitano 1985) and estimates by Rice et al. (1990) and Abel and Sokol (1987, 1991a,b). The cost categories included in estimates of the costs of treating FAS vary across these studies. Generally included, however, are the costs of care for low-birthweight babies, surgical correction of FAS-related birth defects (e.g., cleft palate), heart defects, auditory defects, and moderate or severe mental retardation. A comprehensive list of health care services related to treatment and care for individuals with FAS is presented in table 4.12.

Many limitations in studies of the effects of FAS suggest that further research is needed to confirm existing conclusions. For example, physical deformities, which have been identified as a priority among FAS cases, may in fact be much less complicated to rectify than certain neurobehavioral effects. Weiner and Morse (1994) have also reported on some methodological problems in the FAS studies conducted to date. These methodological problems stem from experimental bias due to the study of the most severe FAS cases, lack of a control group, small sample sizes, and cognitive measurements taken only once or twice during the developmental continuum.

Some apparent consequences of FAS may self-remediate, whereas other "symptoms" of FAS may occur in a person without FAS having been a causal factor. Ventricular septal defects may disappear with time (Streissguth and Giunta 1988). Conversely, conditions such as cleft palate and hearing loss may be found among FAS sufferers, but the conditions themselves were not necessarily brought on by FAS (American Cleft Palate-Craniofacial Association 1993). Estimates of "background prevalence" of these conditions have been used to adjust downwardly the incidence of these problems attributed to FAS in this analysis.

Table 4.12

Categories of Health Care Services Necessitated by Fetal Alcohol Syndrome

Period During Which Care Was Required	Types of Care Required
Immediate neonatal care	Neonatal intensive care Hospital evaluation
Intermediate care (ranging from early to late childhood)	Heart defects and surgery Cleft palate correction and speech therapy Neurotube treatment Audiological evaluation and surgery
Long-term direct treatment	Institutional services for child through adult life for FAS victims with mental retardation Day services for adult FAS victims with mental retardation
Other long-term direct costs	Special education for minimal and moderate degrees of mental retardation Training Rehabilitative programs

Some of the conditions previously attributed to FAS have been dropped from this analysis, but future analyses may need to add certain categories. Heart defects, for example, were dropped from this analysis because experts have reported low frequency and because heart defects have a tendency to self-remediate. One category that should be added in future studies is psychological testing and services for FAS children and their families. Streissguth and Giunta (1988) found that 62 percent of FAS children are hyperactive and often manifest symptoms of antisocial personality disorder or other mental health problems (aside from developmental disabilities). More data on the incidence and severity of psychological sequelae associated with FAS are needed, however, before this category may be added.

Harwood and Napolitano (1985) estimated the cost for FAS care and services in 1980 to be $3.2 billion. In addition, Harwood and Napolitano estimated the lost productivity due to mental retardation. According to the study, for a midrange incidence rate of FAS (1.6 cases per 1,000), lost productivity amounted to $853 million in 1980.[11] Abel and Sokol (1987) estimated the cost of treatment for FAS to exceed $321 million, not counting supported and institutional living for adults older than age 21. Rice et al. (1990) did include residential care for mentally retarded adults and estimated the direct-care costs to be $1.61 billion in 1985. Residential care in the Rice et al. (1990) study accounted for almost 80 percent of total direct costs of FAS. Abel and Sokol (1991b) reestimated the cost in 1991 to be $249.7 million.

Based on the dissimilarities and limitations in cost components captured in major studies completed to estimate the costs of FAS, the most accurate assessment of costs based on these studies could come from a comparison of the first-year costs emanating from the studies. However, the initial and subsequent research of Abel and Sokol does not specify the sequence of treatment of several of the organic anomalies associated with FAS. This is also true for the Rice et al. (1990) study, which is based on the work of Abel and Sokol. Abel and Sokol (1987) also point out that different levels of facial abnormalities as well as different levels of mental retardation contribute to differences in cost. Further, the later Abel and Sokol studies (1991a,b) identified additional organic abnormalities (e.g., spina bifida) that were not captured in the earlier study. The potential for inconsistencies across the studies in identifying "true" first-year cost components precludes the possibility of a comparative analysis of first-year costs.

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[11] Based on 225,000 FAS victims of working age (18 to 64 years old).

4.4.1.3.2 Estimating the Cost of Fetal Alcohol Syndrome for 1992

To calculate the costs of FAS for 1992, this study reestimated (1) the nature and cost of specific types of treatment, (2) the proportion of FAS cases requiring services, and (3) the duration of services. Recent literature on the effects of fetal alcohol exposure and FAS were reviewed, and experts were contacted to lend judgment concerning the data. This study assumes that 2.0 per 1,000 live births in 1992 had FAS and that 2.0 per 1,000 persons up to age 20 were born with FAS (note that Harwood and Napolitano [1985] found no excess mortality among the FAS population in this age group). This study also assumes that 1.0 per 1,000 persons over the age of 20 had FAS: This assumption reflects generally lower rates of drinking among expectant mothers prior to 1973. Based on the assumptions described in table 4.13, the direct cost of FAS in 1992 is estimated to be $1.9 billion.

4.4.1.4 Conclusion

This study benefited from a lengthy and vigorous debate over the extent of FAS in the United States during the past 20 years and relies on the NIAAA estimate of 2.0 cases per 1,000 live births. Additional research is required, however, in examining the differences across racial and ethnic lines found in the United States. Additional research is also needed concerning the long-term effects of FAS on cognitive and physical development and the degree of assistance that FAS sufferers require throughout the course of their lives. Additional data on the proportion of persons with varying degrees of developmental disability treated in ambulatory and inpatient settings or through home-health arrangements, their respective costs, and their durations all require further exploration.

In addition to the previously identified cost components, the social costs of FAS have not been fully explored. For example, the quality of life of individuals with FAS has not been studied. Another area for further study is the effect of familial environment on the FAS victim and on the progression and treatment of his or her condition. Finally, Streissguth (1994) points out that 58 percent of FAS victims are mentally retarded, but often these individuals and their families cannot find or access support services within their community. Streissguth (1994) also found that borderline retardation may be related to other specific problems, such as delinquency and criminality. Research into the costs associated with fetal alcohol effects (not diagnosable as FAS) is also needed; these costs have not been included in this analysis.

Table 4.13

Health and Other Services for Fetal Alcohol Syndrome, 1992

Specific Birth Defect	Annual Cost of Treatment	Length of Treatment Period	Percent in FAS	Population Served	Total Cost (millions)
Prenatal growth retardation	Neonatal intensive care: 7 days at $2,000/day	Once, first year	80.0%	6,365	$89.1
Postnatal growth retardation	Hospital evaluation, $2,357	Once, first year	80.0%	6,365	$15.0
Audiological defects	Neonatal screening, $97	Once, first year	100.0%	7,956	$0.8
	AVR test, $263	Once, first year	56.0%	4,455	$1.2
	Acoustic impedance test, $51	Once, first year	56.0%	4,455	$0.2
Serous otitis media	Surgery, $1,315, incl. recovery	Once, first year	81.0%	6,444	$8.5
Midsensorineural hearing loss	Hearing aid evaluation, $124	Once by 12 yrs.	27.0%	2,205	$0.3
	Hearing aids, $750	Once by 12 yrs.	27.0%	2,205	$1.7
	Hearing aid check, $230	Once by 12 yrs.	27.0%	2,205	$0.5
	Hearing aid orientation, $81	Once by 12 yrs.	27.0%	2,205	$0.2
Minimal brain dysfunction	Special education: one teacher plus one 7-hour educational assistance per 10 students at $5,650/year	Ages 5–18	53.0%	52,955	$299.2
Mid-moderate mental retardation	Special education: one teacher plus one 7-hour and one 4-hour educational assistance per 7.5 students at $7,790/year	Ages 5–21	18.0%	20,661	$161.0
	Home care, $32,850/year	Ages 22–65	14.4%	20,751	$681.7
	Residential care, $36,500/year	Ages 22–65	3.6%	5,188	$189.4
Severe mental retardation	Residential care, $36,500/ year	Ages 5–65	5.0%	12,945	$472.5
Cleft palate	Series of operations plus followup for hearing and speech, $20,000	Once by 15 yrs.	12.5%	990	$19.8
	Speech therapy at $35/session, weekly	One year between ages 5 and 15	12.5%	997	$1.8
Neurotube	Surgery, at $10,312	Once by 10 yrs.	1.8%	150	$1.5
TOTAL					**$1,944.2**

SOURCES: Previous studies of the costs of treating FAS: Russell (1980); Harwood and Napolitano (1985); Rice et al. (1990); Abel and Sokol (1987, 1991a,b). Population data: U.S. Bureau of the Census (1994).

NOTES: Components may not sum to totals because of rounding. Cost does not account for mandatory Federal early intervention programs for alcohol- and drug-exposed infants and toddlers, ages 2 to 4. Prevalence in FAS population is the proportion who need services. Somewhat fewer persons actually receive needed services, although there are no data available at present to estimate the proportion of care delivered versus needed.

4.4.2 Drug-Exposed Infants, Boarder Babies, and Abandoned Infants

It cost about $407 million in extra hospital costs to treat drug-exposed infants and to house abandoned babies in 1992.

4.4.2.1 Synopsis

Newborns and infants may experience extra hospital stays as a result of drug abuse for at least two reasons: (1) complications due to pre- or perinatal drug exposure and (2) the need for temporary shelter when abandoned. This study estimates that drug exposure resulted in an additional $360 million in hospital costs for newborns and that "boarder babies" cost an additional $47 million for housing beyond what is medically required. A newborn with exposure to cocaine and one or more other drugs had increased hospital costs of $7,731, and cocaine-only exposure is related to $1,223 in additional costs. Boarder babies cost about $586 per day beyond the date medically cleared for discharge, with an average of 11 days of extended hospital stay per boarder baby.

4.4.2.2 Drug-Exposed Infants: Prevalence

Recent estimates place the number of infants exposed in utero to one or more illegal drugs at between 625,000 to 729,000 per year (about 15 to 18 percent). Testing of newborns yields lower rates: A survey for California found that 5.2 percent of newborns tested positive for exposure (adjusted to the U.S. demographic distribution, this is 7 percent or 287,800 newborns).

Drug consumption by the mother may or may not have serious repercussions for the fetus. The next section discusses sequelae of fetal drug exposure. In estimating the economic costs associated with drug-exposed infants, estimates of the prevalence of drug exposure must be supplemented with an assessment of the extent to which such exposure would produce medical or developmental consequences for affected fetuses and infants. Two variables may affect the impact of drug consumption on a fetus: (1) timing of the consumption relative to developmental stages of the fetus and (2) the quantity and frequency of drugs consumed. It is not known how many mothers of newborns have used drugs at intensive versus low levels; however, one recent study has estimated that about 105,000 of these women have used drugs to such an extent that they probably meet clinical criteria for needing treatment. The best documented effects of in utero drug exposure are primarily associated with cocaine exposure. There are no rigorous studies that support the contention that drug-exposed infants are more likely to suffer specific birth defects or patterns such as FAS.

A recent Department of Health and Human Services report to Congress found that for all of 1991, there were an estimated 10,000 boarder babies (newborns who are medically cleared for discharge but are held in hospital for nonmedical reasons). On a given day in 1991, about 300 boarder babies were in hospitals. Maternal drug abuse appears to be a major factor in this problem: An estimated 74 percent of the mothers of boarder babies had used drugs shortly before delivery, based on urinalysis or self-report. Detection of maternal drug use is often cause for delayed discharge, since child welfare services must assess the fitness of the parents and/or arrange for alternative living situations (foster care) before discharge.

Although no direct national-level estimates have been made of this problem, several studies have yielded "order-of-magnitude" estimates. Two studies have applied findings from the 1988 and 1990 National Household Surveys on Drug Abuse to estimate that 625,000 to 739,000 pregnant women illicitly used drugs. Studies of women delivering in particular hospitals have yielded rates ranging from several percent to more than 30 percent. Representative surveys in California, Ohio, and Rhode Island estimated by using urinalysis that 1.1 percent, 1.4 percent, and 1.4 percent, respectively, of newborns in those States had been recently exposed to cocaine.

Several limitations complicate estimates of the number of children born drug-exposed each year, and these limitations relate to both the data currently available and the methodologies used to obtain these data (CSAP 1994; Gomby and Shiono 1991). For example, no national-level studies have been conducted on the prevalence of prenatal drug exposure. Most data come from either small-scale studies conducted at the State, community, or hospital level or from national studies that assess alcohol, tobacco, and other drug use in the general population (CSAP 1994). Data collected in these studies can often either underestimate or overestimate the extent of the problem. For example, small-scale studies tend to occur in settings where prevalence is believed to be high, which yields unrepresentative prevalence estimates, whereas studies that focus solely on women who receive prenatal care and deliver their infants in a hospital can underestimate the true nature of the problem. Furthermore, most studies were conducted in urban areas, and data collected from urban studies are not representative of drug use for the whole country. Also, studies conducted in urban areas (particularly in inner-city hospitals) therefore overrepresent low-income populations and ethnic minorities, which probably yields overstated prevalence estimates among these populations.

Methodological problems also present challenges to developing accurate estimates for the prevalence of drug-exposed infants. Both the scientific technology and the sampling methodology used to gather data are subject to limitations and bias. Prevalence data are collected through either a drug test—given to the mother, the infant, or both—or through a mother's self-report of alcohol and drug use; ideally, a comprehensive survey would collect information using both methods. Sensitive scientific tests such as blood and urine analyses can only detect alcohol and drug exposure within a narrow timeframe and, as a result, are often inaccurate (Gomby and Shiono 1991; CSAP 1994). For example, urine tests used to detect cocaine use only work within 48 hours of the last time of use. In addition, tests can only detect a single substance, and a significant number of drug-exposed infants have been exposed to multiple drugs, including alcohol and tobacco. As a result, scientific tests often present uneven results.

Self-reporting underestimates actual prevalence rates because women are more likely to deny alcohol and drug use during pregnancy for fear of losing their children to child protective services. Another obstacle to acquiring prevalence data is that there is no standard protocol for testing newborns for illicit substances, and testing methods often oversample low-income racial and ethnic minorities. Finally, medical professionals may not be trained or have up-to-date information concerning identification of drug abuse among expectant mothers.

Despite these limitations, several studies have attempted to estimate the number of alcohol- and drug-exposed newborns. Several national-level studies have addressed the number of women of childbearing age who use drugs and how many enter drug treatment. Women of childbearing age are defined as being between the ages of 15 and 44. In 1991, there were approximately 59 million women of childbearing age in the United States (S. Alford, Advocates for Youth, 1994, personal communication). Analysis of the National Household Survey on Drug Abuse (NHSDA) indicates that 10 percent of these women reported illicit drug use within the past year and 5 percent within the past month (National Institute on Drug Abuse 1991a). Women between the ages of 18 and 25 had the highest rates of drug use (27 percent in the past year; 13.3 percent in the past month), and marijuana was the most frequently used drug by women of all ages. A 1990 Institute of Medicine study estimated that 105,000 pregnant women per year were in need of drug treatment (Gerstein and Harwood 1990).

Despite the lack of available studies and the limitations in methodology for obtaining precise and conclusive data on drug-exposed infants, the information currently available does provide a baseline indication of the scope of the problem. Also, current data demonstrate that among those women who use and abuse illegal drugs, women of childbearing age are the age cohort most at risk (NIDA 1991b). Table 4.14 summarizes the results of several studies that have estimated the number of drug-exposed infants born annually.

A recent report by the U.S. Department of Health and Human Services (1993b) estimated that during 1991 there were 10,000 boarder babies (about 300 on a given day). About 74 percent of boarder babies were estimated to be drug-exposed, based on urinalysis testing or maternal self-reports. The data were collected from 851 hospitals across the Nation that were identified by State child welfare offices as possibly having boarder babies. Drug exposure was detected in most of the cases by drug testing both the mother and the infant, though in some cases only the mother or only the infant was tested. The authors suggest that the study may underestimate the true extent of the problem for two primary reasons. First, State child welfare agencies may be unaware of or reluctant to share information on the problem. Second, hospital staff are reluctant to divulge data for fear of losing Medicaid reimbursement, and hospitals lack consensus on deciding when an infant is ready for medical discharge. Most of the boarder babies and abandoned infants were concentrated in urban hospitals, and 75 percent of boarder babies and 67 percent of abandoned infants were African-American (U.S. Department of Health and Human Services 1993b).

Two surveys of treatment providers yield data on the number of women of childbearing age who enter drug treatment. The State Alcohol and Drug Abuse Profile (SADAP) from 1990 surveyed treatment units that received at least some funds administered by the State Drug Agency. SADAP reported 255,000 admissions of women, and of those, nearly 90 percent were of childbearing age (National Association of State Alcohol and Drug Abuse Directors 1994). SADAP provided no breakdown by ethnicity or gender for primary drug of choice, but cocaine, marijuana, and heroin were the drugs for which people primarily sought treatment. The National Drug and Alcoholism Treatment Unit Survey (NDATUS) from 1991, which included both private and publicly funded treatment units, found 132,000 women enrolled in drug or combined drug and alcohol treatment on any given day. Based on the NDATUS finding that the annual client count is about four times the daily census, this indicates that 528,000 women with drug or combined drug and alcohol problems were treated in 1991. No data were available to specify how many of these women were of childbearing age (SAMHSA 1993a), although it was reported that 4.9 percent of the women in treatment were pregnant—suggesting that 26,000 pregnant women were treated for drug or combined drug and alcohol problems in 1991.

Table 4.14

Overview of Selected Studies of Drug-Exposed Infants

Authors, Publication Date	Population Studied	Study Methodology and Population	Major Findings
Joyce et al. (1994)	Hospital	Application of prevalence rates from a California State study to national birth figures was used to estimate national prevalence for 1991; the hospital-based prevalence data used information on all patients who delivered at large New York City hospitals during a 5-month period.	287,800 black, white, and Hispanic infants were born exposed to illegal drugs in 1991 11.2% of the hospital sample were exposed to one or more drugs
Zuckerman et al. (1989); Frank et al. (1988)	Hospital	Assessed cocaine and marijuana use by interviews and urine tests obtained prenatally and immediately post partum from 679 women enrolled in prenatal care at Boston City Hospital between 1984 and 1987.	18.0% cocaine 27.0% marijuana 4.0% opiates
MacGregor et al. (1990)	Hospital	Urine tests for marijuana prevalence among 322 women delivering in an urban hospital admitted during a 1½-month period in 1987.	19.9% marijuana 32.3% public prenatal care patients 7.5% private prenatal care patients
Chasnoff et al. (1990)	Population	Urine tests of all pregnant women enrolled for prenatal care during a 1-month period in 1989 at any of 5 public clinics and at any of 12 private obstetrical practices in Pinellas County, Florida.	3.4% cocaine 11.9% marijuana 0.3% opiates
Gomby and Shiono (1991)	Population (national survey)	Used the 1990 NIDA National Household Survey on Drug Abuse (NHSDA) and 1987 national birth rates to estimate prevalence of alcohol, tobacco, and other drug use among pregnant women (ages 12–34).	4.5% cocaine 17.4% marijuana
Gerstein and Harwood (1990)	Population (national survey)	Used the 1988 NIDA NHSDA to determine (1) the numbers of infants exposed each year to one or more illicit drugs and (2) the number of pregnant women in need of treatment.	350,000 to 625 infants are exposed each year to 1 or more illicit drugs 105,000 pregnant women are in need of drug treatment

SOURCE: CSAP (1994).

4.4.2.3 The Effects of Prenatal Drug Exposure

The use and abuse of illegal drugs during pregnancy pose increased risks for a woman's health and the subsequent health of her child. Several issues complicate the ability of researchers to arrive at specific conclusions as to the effects of prenatal alcohol and drug exposure, including the following:

- Many children are exposed to a variety of risk factors, including polydrug use and exposure to alcohol and cigarettes, which makes it difficult to assess the impact of specific substances.
- Other risk factors, such as poverty, poor maternal health and nutrition, and unstable or violent home environments, also significantly affect the health and development of infants and children (CSAP 1994; Zuckerman 1993).

Analyses of the effects associated with prenatal drug exposure must not only focus on the medical and behavioral consequences of substances on the infant, but also acknowledge the role that other risk factors play in the health and development of children. Such factors include postnatal drug use/abuse and unstable and violent home environments. Research has also shown that symptoms of drug exposure seen at birth and in infancy do not predict adverse outcomes for later child development (CSAP 1994).

Studies that assess the effects of prenatal exposure of drugs identify a general range of effects among the sample population, but it is important to remember that individuals react to and break down drugs differently. Individual differences in the length of time a drug stays active in a person's system, the level of craving, and duration of the "high" all influence the effects that drug use/abuse has on the developing fetus (CSAP 1994). The following are some of the general effects of prenatal drug use on newborns and infants:

- Growth variations, including intrauterine growth retardation and low birth weight, reduced birth length, and reduced head circumference;
- Health risk, including increased risk for premature birth and/or low birth weight;
- Sudden infant death syndrome (opiate use is the single strongest factor);
- Withdrawal symptoms (specific to opiate use); and
- Neurological and neurobehavioral impairment.

Table 4.15 provides a summary of the effects of specific drugs on infants and newborns (CSAP 1994; Zuckerman 1993). Again, since many persons use or abuse more than one type of substance (including alcohol, drugs, and tobacco) during pregnancy, it is difficult to pinpoint the effect of a specific drug. For research purposes, however, researchers usually study the drug the sample population uses most frequently.

Table 4.15

Effects of Specific Drugs on Infant Health, Growth, and Development

Drug	Effects on Health and Growth	Effects on Development and Behavior
Marijuana	Risk for reduced birth weight and reduced birth length.	Some evidence of lower performance in the areas of motor ability, memory, and verbal ability, but firm conclusions are lacking.
Opiates	Risk for low birth weight for gestational age; smaller head circumference; neonatal abstinence syndrome (NAS), whose signs include diarrhea, fever, sneezing, yawning, tremors, seizures, irregular breathing, and irritability.	Risk for high levels of arousal and irritability, tremulousness, and motor behavior up to 1 month after birth, but the statistical differences between exposed and nonexposed infants in terms of behavior and development tend to be small.
Cocaine	Increased risk for miscarriage or stillbirth; increased risk for premature delivery; reduced birth length; reduced head size; reduced weight; statistically significant increased risk for congenital malformations.	Risk for delays in motor growth on muscle tone, primitive reflexes, and volitional movement; irritability; potential for altered nerve cell organization and interaction.

4.4.2.4 The Economic Impact of Drug-Exposed Infants, Boarder Babies, and Abandoned Infants

Limited data are available on the economic costs associated with drug-exposed infants. Estimates of the cost of treating drug-exposed infants find that most costs occur in neonatal intensive care units (NICU's) for treatment of complications of drug exposure. This study does not include long-term medical, social welfare, or educational costs related to prenatal alcohol and drug exposure.

A 1990 U.S. General Accounting Office (GAO) study estimated median hospital charges for each drug-exposed infant to be $1,100 to $4,100 higher than those for nonexposed infants. One researcher has multiplied these cost ranges and the Institute of Medicine's national prevalence estimates to arrive at yearly costs to treat drug-exposed infants that are between $385 million and $3 billion (Chasnoff 1991). These estimates should be treated with caution for several reasons. One reason is that not all drug-exposed infants require longer hospital stays and do not, therefore, necessarily incur costs above and beyond those of unexposed infants. Also, the GAO study does not distinguish between different types of drug use, and it is not clear whether marijuana was included in the study. Further, the study does not account for other risk factors such as prenatal care, alcohol use, and racial and ethnic background.

A study by Phibbs et al. (1991) estimates that $504 million in medical care costs are attributable to cocaine-exposed infants for 1990. It should be noted, however, that not every newborn and infant exposed prenatally to cocaine requires a longer hospital stay. Most of the costs were concentrated among a small percentage of newborns who required stays in the NICU. The study, which is based on data collected at Harlem Hospital from 1985 to 1986, arrived at its estimate by multiplying Gomby and Shiono's (1991) estimate of 158,000 cocaine-exposed children with an average neonatal hospital cost of $3,182. The study adjusted for other risk factors, such as race, maternal age, prenatal care, and maternal alcohol consumption. The study also controlled for cocaine and crack cocaine use, with crack cocaine resulting in much higher average costs in terms of medical treatment.

The study by Phibbs et al. (1991) may underestimate costs because it excludes physician costs, which tend to account for 15 to 20 percent of NICU costs, and because it considers only short-term hospital costs; also, the cost estimates depend on prevalence rates, which vary across prevalence studies. Conversely, the study may overestimate the costs associated with prenatal cocaine exposure. The sample population at Harlem Hospital had a much higher rate of crack cocaine use than the general population. Crack cocaine use as a percentage of total cocaine use among women of childbearing age is 13.3 percent, as opposed to 33 percent in the Harlem Hospital population. Adjusting the costs to account for this lower percentage of crack use in the general population yields an average yearly cost of around $310 million attributable to cocaine-exposed infants.

A 1994 study by Joyce et al. estimated that direct costs related to prenatal exposure to illegal drugs was $387 million for 1991. The study compared exposed and unexposed populations at a municipal hospital in New York City for a 6-month period, and the study categorized exposure as follows: cocaine exclusively; drugs other than cocaine—heroin, methadone, marijuana; and cocaine and some other drug. Although the study did not distinguish between cocaine and crack cocaine, it did adjust for factors such as prenatal care, race, and maternal age; 85 percent of the sample population was black. Sixty percent of the exposed sample used cocaine and some other drug, and this population accounted for most costs. On average, infants born exposed to cocaine and some other drug had a length of stay that was 7 days longer than that of unexposed infants and hospital medical costs that were $7,731 higher than those of unexposed infants. Infants exposed only to cocaine had a modest increase in length of stay and costs, whereas exposure to drugs other than cocaine had little impact on length of stay and direct costs. The study also reported that 60 percent of newborn costs were the consequence of adverse birth outcomes and newborn infection. The major limitation of the study is that its data and cost estimates came from a single institution and may not reflect national variations for direct medical costs.

The 1993 U.S. Department of Health and Human Services (1993b) report on boarder babies and abandoned infants suggests that care for boarder babies cost $22 million to $125 million in total. The report does not, however, supply a means to estimate what proportion of the costs is attributable solely to effects of drug exposure; rather, the study implicitly assumes that some of the costs relate to caring for drug-exposed infants. The costs of boarder babies were calculated by using actual hospital costs and contrasting mean and median lengths of stay past medical discharge. Median hospital charges above account for $22 million, although ancillary services plus accounting for very high-cost infants suggest that the true cost may be closer to $125 million.

In utero drug exposure of neonates—primarily to cocaine—is associated with generally poorer birth outcomes and associated hospital costs. However, there is little rigorous evidence and certainly no consensus that in utero drug exposure causes unique and specific birth defects or other health or behavioral problems, such as those identified with FAS, beyond the neonatal stage. General population studies suggest that 15 to 18 percent of women in their childbearing years use illicit drugs in a year (primarily marijuana). Urinalysis tests of mothers and infants at birth indicate 5.2 percent to 7.5 percent of mothers have used drugs.

4.4.2.5 Conclusion

Newborns and infants may experience extra hospital stays as a result of drug abuse for at least two reasons: (1) complications due to pre- or perinatal drug exposure and (2) the need for temporary shelter when abandoned. Averaging results from prior studies, this study estimates that drug exposure resulted in an additional $360 million in hospital costs for newborns and that boarder babies cost an additional $47 million for housing beyond what is medically required. A newborn with cocaine-plus-other-drug exposure had increased hospital costs of $7,731, and cocaine-only exposure was related to $1,223 in additional costs. Boarder babies cost about $586 per day beyond the date medically cleared for discharge, with an average of 11 days extended hospital stay per boarder baby.

4.4.3 Tuberculosis

Drug abuse-related behaviors are estimated to cause 2 to 7 percent of the tuberculosis cases in the United States each year, and the cost of treating these cases in 1992 is estimated to have been $30 million.

4.4.3.1 Synopsis

After 35 years in which the incidence of tuberculosis declined by an average of 6 percent per year, tuberculosis cases have increased each year since 1985. Between 1985 and 1991, 39,000 cases of tuberculosis occurred in excess of those expected based on previous trends. The Centers for Disease Control and Prevention (CDC) reported 26,673 cases of tuberculosis in 1992. Limited studies suggest that between 600 and 1,800 of these cases are related to drug use, or 2 to 7 percent of reported cases. This report uses a median of 1,200 cases, or 4.5 percent of annual cases.

For 1991, the CDC estimates that $617 million was spent on inpatient and outpatient costs for tuberculosis, of which $27.8 million is associated with drug use. Federal public health and research activities by CDC and the National Institute of Allergy and Infectious Diseases (NIAID) cost $50 million, of which 4.5 percent, or $2.25 million, may be allocated to drug abuse. CDC and NIAID funding will total $170 million in 1994. There is a risk that the incidence and the health care costs associated with tuberculosis may continue to climb with the recent increase in multiple-drug-resistant tuberculosis.

A recent CDC study (Bloch et al. 1994) determined that 14.2 percent of tuberculosis cases (472 out of a representative sample of 3,313 culture-positive tuberculosis cases) were resistant to 1 or more antituberculosis drugs, and nearly 10 percent (315 out of 3,313 reported tuberculosis cases) were resistant to the 2 most commonly used antituberculosis drugs, isoniazid and rifampin. The cost to treat multiple-drug-resistant tuberculosis can reach $250,000 per patient if hospitalization is required, and co-occurrence of tuberculosis with human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) presents other health problems and costs as well. In addition, drug users are less likely to have insurance and more likely to be dependent on publicly provided health care.

4.4.3.2 Tuberculosis in the United States

Tuberculosis is primarily an airborne disease and is spread from person to person through droplets from coughing, speaking, laughing, or sneezing. Adequate ventilation is the most important measure to prevent the transmission of tuberculosis. It is estimated that between 12 and 15 million people in the United States may be infected with tuberculosis, but only 10 percent of those persons will develop active tuberculosis in their lifetime (NIAID 1993; Ellner et al. 1993). In contrast, a person dually infected with tuberculosis and HIV has a 7- to 10-percent chance per year of developing active tuberculosis.

In 1953, about 85,000 cases of tuberculosis were reported. During the next 32 years, incidence declined by an average of 6 percent per year. However, tuberculosis cases have increased each year since 1985. Between 1985 and 1991, 39,000 cases of tuberculosis occurred in excess of those expected based on previous trends. The CDC reported 26,673 cases of tuberculosis in 1992.

The populations at highest risk for developing active tuberculosis include immigrants from countries with a high incidence of active tuberculosis, drug users, the poor and homeless, persons with HIV/AIDS, and those living in inner cities and certain geographic areas.

Persons living in crowded shelters and prisons are particularly at risk for tuberculosis because of crowded conditions and poor ventilation. Others with an increased risk of being exposed to and contracting tuberculosis include injection drug users and the poor and homeless, who are likely to be more susceptible because of poor nutrition and poor health (NIAID 1993; Bloch et al. 1994). Also at risk are residents of long-term facilities, such as nursing homes. As the result of weakening immune systems, these residents often suffer recurrence of latent tuberculosis infections; the elderly are the majority of this group.

Persons with HIV/AIDS are vulnerable to reactivation of latent tuberculosis infections and are also susceptible to new tuberculosis infections. These cases usually occur in hospitals, prisons, and shelters, where HIV-infected persons constitute a growing proportion of the population. (NIAID 1993; Bloch et al. 1994; Ellner et al. 1993).

Tuberculosis is disproportionately prevalent among racial and ethnic minorities. The NIAID (1993) reported that in 1991 more than 56 percent of active tuberculosis cases were among Hispanics and African-Americans. The CDC's recent study on multiple-drug-resistant tuberculosis found that racial and ethnic minorities were 10 to 50 times more likely to develop active multiple-drug-resistant tuberculosis than non-Hispanic whites (Bloch et al. 1994).

Another key risk group comprises immigrants from countries where tuberculosis case rates are high. Many of these immigrants live in crowded housing. Because of economic and language difficulties, they have limited access to health care and may not receive treatment (NIAID 1993).

Geography is a strong risk factor, particularly for multiple-drug-resistant tuberculosis. More than three-fifths of multiple-drug-resistant tuberculosis cases nationwide have been found in New York City, and inner-city environments seem to present areas of higher risk (Bloch et al. 1994).

There is no single cause for the increase in tuberculosis cases and the emergence of multiple-drug-resistant tuberculosis as major health problems. Federal funding for tuberculosis control dramatically decreased in the 1970's, and only recently have funding levels risen to counter the increased incidence of tuberculosis. Beyond the low funding, the risk factors mentioned above constitute the primary factors associated with increased tuberculosis infection.

The major reason for the development of multiple-drug-resistant tuberculosis is noncompliance with standard regimens of tuberculosis treatment. Normal tuberculosis treatment should last 6 to 9 months and consist of two or more drugs (Iseman et al. 1993; Bloch et al. 1994). But high-risk populations, such as drug and alcohol abusers, the homeless, and persons who migrate from city to city, often quit tuberculosis treatment early. Data recently collected by the CDC indicate that only 77 percent of patients completed a recommended course of therapy in 12 months. Many multiple-drug-resistant tuberculosis cases may also develop when patients are treated with too few drugs or with inadequate doses (Bloch et al. 1994).

4.4.3.3 The Relationship Between Drug Use and Tuberculosis

The link between drug use and tuberculosis is primarily economic and social. Tuberculosis and drug use frequently occur in low-income, high-density living situations that have correspondingly poor community health, and these factors facilitate the spread of the airborne particles that transmit tuberculosis from person to person (Reichman et al. 1979).

The CDC is establishing a system for ascertaining the number of tuberculosis cases associated with drug use. Only a few studies have attempted to estimate this percentage. A study published in 1979 estimated that drug-dependent persons were two to six times more likely to contract tuberculosis than non–drug-dependent persons (Reichman et al. 1979). Using this study as a model, 600 to 1,800 cases occur per year among the roughly 5 to 6 million drug-dependent and abusing persons over what would be expected if drug abuse were not a risk factor for tuberculosis.

The link between HIV/AIDS and tuberculosis provides another way for estimating tuberculosis cases related to drug use. The CDC reports that in 1993 about 36 percent of new AIDS cases were associated with intravenous drug use (CDC 1993a). An estimate from a recent tuberculosis symposium put the number of tuberculosis patients with HIV/AIDS at 2,500 to 5,000 cases (10 to 20 percent of total tuberculosis cases per year) (Ellner et al. 1993). Multiplying 36 percent by the estimate of 2,500 to 5,000 HIV/AIDS-related tuberculosis cases yields a total range of 900 to 1,800 cases associated with intravenous drug use.

Also, a recent survey of multiple-drug-resistant tuberculosis outbreaks in four hospitals in New York City and one each in upstate New York, New Jersey, and the New York State Correctional System found that more than 90 percent of patients with multiple-drug-resistant tuberculosis have HIV infection, with case fatality rates as high as 70 to 90 percent (Bloch et al. 1994). It is probable that many of these cases could be associated with intravenous drug use.

To better capture data of this nature, the CDC in 1993 amended its tuberculosis data extraction form and tuberculosis surveillance system to require information on HIV status and injecting and noninjecting drug use for verifiable cases of tuberculosis. For now, an estimated 1,200 annual tuberculosis cases are associated with drug abuse. The estimate appears to be relatively conservative, but it is within the plausible range suggested by the limited evidence in hand.

4.4.3.4 Costs of Treating Tuberculosis

The standard length of treatment for tuberculosis is 6 to 9 months and involves taking drugs daily or two or three times weekly (Iseman et al. 1993). Treatment occurs in one of two ways for most tuberculosis patients: self-administered treatment, in which the patient is responsible for taking drugs, or directly observed treatment, in which the patient must take medication in the presence of medical staff. Directly observed treatment is the preferred method because it allows tracking of the patient's record for taking medication. Hospitalization of tuberculosis patients is usually reserved for persons who are noncompliant with their treatment, particularly if they have multiple-drug-resistant tuberculosis. Adherence to a prescribed treatment regimen is important, and failure to complete a standard course of therapy promotes the emergence of drug-resistant strains of tuberculosis.

Treatment length for persons with multiple-drug-resistant tuberculosis can last 12 to 24 months, and completion of this treatment is difficult to monitor because of its length and the population being treated (Ellner et al. 1993; Mahmoudi and Iseman 1993). Many multiple-drug-resistant tuberculosis patients stop taking medication after a few weeks because they feel better or because the drugs have unpleasant side effects (NIAID 1993).

The CDC is currently performing a detailed study of the hospitalization costs related to tuberculosis, and the results will be available later in 1994. However, in an unpublished study, the CDC estimated that in 1991 about $617 million was spent on the treatment of tuberculosis, of which $182 million was for outpatient costs and $435 million was for inpatient costs (CDC 1994b, personal communication). These estimates include medication costs associated with tuberculosis treatment. This amounted to about $23,000 per reported case in 1991.

However, the costs to treat multiple-drug-resistant tuberculosis can be as high as $250,000 per patient (Iseman et al. 1993). Costs are quite high because it is often necessary to hospitalize multiple-drug-resistant tuberculosis patients for extensive periods of time, and the total course of treatment (inpatient plus outpatient) can require up to 24 months.

Several variables affect the course and treatment of multiple-drug-resistant tuberculosis. One important variable is making the correct diagnosis. A recent study of 35 multiple-drug-resistant tuberculosis patients who were identified and treated in 1989 and 1990 found that 28 had received an improper diagnosis or management error during treatment (Mahmoudi and Iseman 1993). The most common errors were adding one drug to a failing regimen, failure to detect drug resistance, and failure to deal with noncompliance with prescribed treatment. As a result of these errors, the 28 patients had an average of 129 days of hospitalization, 63 percent of the patients required surgery, and each patient received an average of 4.8 medications. The errors in diagnosis resulted in $4.8 million in hospitalization costs, which at the time of the study constituted more than one-half of the CDC's tuberculosis elimination budget ($9.1 million in 1990). Also, the drugs to which multiple-drug-resistant tuberculosis patients are resistant are important factors in arriving at treatment costs. Resistance to drugs commonly used in tuberculosis treatment, such as isoniazid and rifampin, can increase treatment length to 18 to 24 months, with the potential for cure decreasing (Ellner et al. 1993).

Tuberculosis is also difficult to diagnose in immune-compromised individuals. Persons with HIV/AIDS may lack the immune response to make the standard tuberculosis skin test reliable (Ellner et al. 1993; NIAID 1993). These persons are referred to as anergic, and additional skin-test control antigens should be used to screen them.

Federal funding for research into tuberculosis control and elimination has risen steadily in the past few years (see figure 4.2). Both the CDC and NIAID are conducting research on tuberculosis. Funding in 1994 for the CDC and its Tuberculosis Elimination Division was $142 million, a threefold increase from its 1992 budget of $46 million and a tenfold increase over the $14 million budget for tuberculosis in 1988.

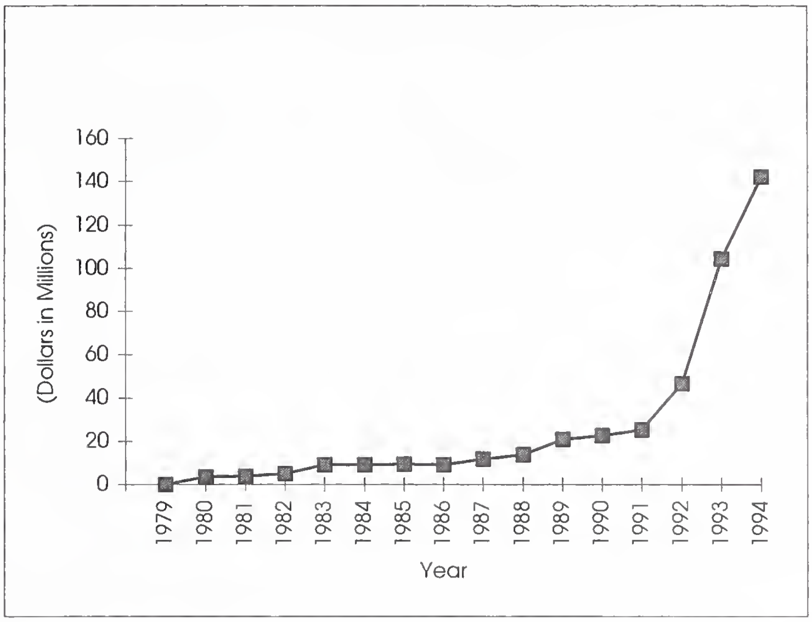
CDC funding primarily occurs in the form of grants, which support activities including directly observed treatment, outreach and screening, and followup of tuberculosis cases. Beginning in 1988, part of the CDC tuberculosis budget was allocated to study both HIV and tuberculosis, and this money has been used to develop registry matching among persons with HIV/AIDS and tuberculosis to provide State and city health departments with resources for conducting screening and preventive therapy at drug treatment centers and correctional facilities and for research on preventive therapy and treatment regimens.

Starting in 1992, CDC-funded activities related to multiple-drug-resistant tuberculosis included strengthening State laboratories, increasing surveillance programs to detect multiple-drug-resistant tuberculosis, and increasing screening among high-risk groups. NIAID, the primary institute for tuberculosis research at the National Institutes of Health, had its funding increased nearly sixfold from 1991 to 1993, with $21 million allocated in fiscal year 1993 and $28 million slated for fiscal year 1994. NIAID has recently formulated a comprehensive research agenda to expand its efforts to eliminate tuberculosis.

4.4.3.5 Conclusion

Total health treatment costs for tuberculosis and expenditures for drug-related cases are summarized in table 4.16. Based on the most current data available (primarily from CDC), total expenditures were $667 million in 1991. Hospital inpatient costs accounted for about two-thirds of this total, outpatient treatment cost another $182 million, and public health and research activities of the CDC and NIAID were $50 million. The estimate of total expenditures may be a modest overestimate because it is likely that some fraction of CDC funding was to deliver tuberculosis treatment. CDC staff were not able to break out this estimate for the purposes of this study.

Figure 4.2
CDC Annual Expenditures for Tuberculosis Elimination, 1979–1994



SOURCE: Centers for Disease Control and Prevention (1994b).

The few studies available suggest that drug abuse is associated with about 2 to 7 percent of tuberculosis cases in the United States. A midpoint estimate of 4.5 percent is used here. Application of this figure to estimated expenditures on tuberculosis shows that about $30 million was spent on drug abuse-related tuberculosis treatment, control, and research in 1991.

These estimates are probably conservative for several reasons. First, public health and research spending on tuberculosis has accelerated dramatically since 1991 (from $50 million to $170 million). Second, the incidence of tuberculosis has increased somewhat since 1991. More important, the incidence/prevalence of multiple-drug-resistant tuberculosis is also believed to be increasing, and it can cost much more to treat than non-drug-resistant tuberculosis.

The most critical component of these estimates is the proportion of tuberculosis cases that are related to drug abuse. There have been very few studies on this issue, but there have been sufficient indications that CDC has recently modified its tuberculosis reporting forms to inquire whether drug abuse is a risk behavior exhibited by a reported case.

Table 4.16

Financial Resources Expended on Tuberculosis Treatment and Elimination, 1991

(millions of dollars)

Type of Expenditure	Total	Drug Related
Treatment costs		
Outpatient	$182.0	$8.2
Inpatient	$435.0	$19.6
Public health/research		
CDC	$46.5	$2.1
NIAID	$3.5	$0.2
Total expenditures	**$667.0**	**$30.2**

NOTE: Components may not sum to totals because of rounding. Treatment costs probably include funds from CDC, but no breakdown is available.

4.4.4 Human Immunodeficiency Virus Infection

Approximately 36 percent of AIDS cases diagnosed in 1992 were attributable to intravenous drug abuse. It is estimated that drug abuse-related HIV and AIDS cases cost $3.7 billion.

4.4.4.1 Synopsis

The CDC monitors the incidence and prevalence of AIDS cases by risk category. To date, approximately 35 percent of all AIDS cases originated with an intravenous drug user (IVDU). About 36 percent of the cases reported in 1992 to the CDC originated with an IVDU. This rate is applied to the total annual cost of treating HIV/AIDS estimated for 1992 (or $10.3 billion spent for inpatient, outpatient, pharmaceutical, long-term care, and home-health services). Approximately 20 percent of the direct medical costs for all persons with HIV and AIDS are covered by Federal and State Medicaid programs. In addition to private insurance, the remaining direct medical costs are covered by other public subsidies and indigent care funds.

These estimates may be conservative, however, because IVDU's are likely to be more dependent on the public health care system than other patients. Because many IVDU's lack insurance or private funding to cover medical expenses, the burden on the health care system will increase as the percentage of IVDU-related HIV cases continues to rise. Finally, this study allocates all HIV/AIDS costs to drug abuse because of the connection with intravenous drug use. However, alcohol may also play a role in transmission of HIV/AIDS by impairing drinkers' judgment and increasing their proclivity to take risks—such as engaging in unprotected sex.

4.4.4.2 Relationship Between Intravenous Drug Use and Human Immunodeficiency Virus

Intravenous drug users contract HIV primarily by sharing contaminated needles. Using data supplied by the CDC, this study estimates that 36 percent of HIV infections in 1992 were attributed to intravenous drug use (CDC 1993a). This includes infections of other IVDU's as well as their sexual partners and children. As of September 1993, there were 11,750 reported AIDS cases among women who had sex with IVDU's and 2,766 pediatric AIDS cases in which the mother was an IVDU or had sex with an IVDU. Since the first AIDS case was reported in 1981, 51 percent of the heterosexual and pediatric transmission cases have been related to intravenous drug use. Many of these cases have involved women who exchange sex for drugs.

The National Institute on Drug Abuse estimates that there are 1.1 to 1.3 million IVDU's in the United States and its territories (Schuster 1988). According to the 1992 National Household Survey on Drug Abuse, however, these numbers may be an underestimate because 660,000 persons in households reported intravenous drug use within the past month and 3 million reported use during their lifetimes. The survey is frequently criticized as an underestimate because it does not cover the more than 1 million prisoners (U.S. Department of Justice 1993a) or 500,000 to 650,000 homeless persons who are IVDU's (Burt and Cohen 1989). Most IVDU's are on the East Coast, with the largest concentration (250,000) reported in New York City. Because of the transient nature of this population, however, accurate estimates are difficult to make.

4.4.4.3 The Human Immunodeficiency Virus Epidemic

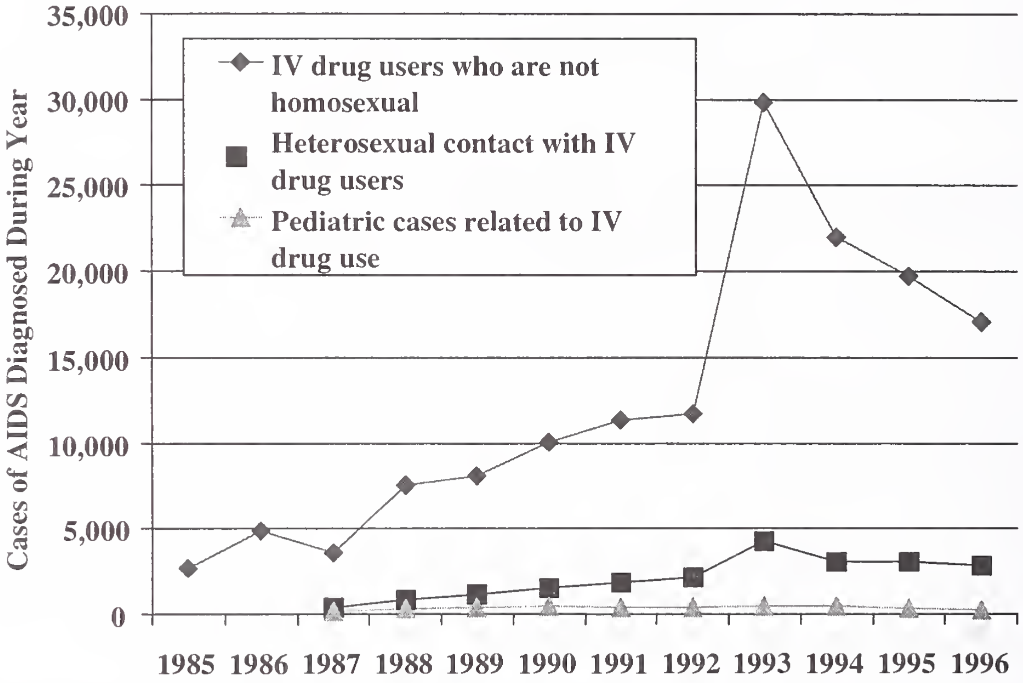
According to the most recent Public Health Service estimates, approximately 1.0 to 1.5 million persons are infected with HIV (CDC AIDS Hotline 1994, personal communication). The incidence of HIV/AIDS grew dramatically from 1985 to 1993, although part of the increased incidence is attributable to major expansions in the definitions of AIDS that were put into effect in 1993. However, since that time, the number of new AIDS cases reported each year has declined. Through 1992, the cumulative number of AIDS cases attributed to intravenous drug use exceeded 68,000.

From 1987 to 1992, the number of newly reported HIV/AIDS cases associated with intravenous drug use increased from 27 percent to 36 percent of the total number of cases. In 1992, an estimated 36 percent of newly reported AIDS cases were drug related (17,115): 25 percent of the total cases were IVDU's (11,738); 6 percent were homosexual IVDU's (2,869); 4 percent were sex partners of IVDU's (2,130); and less than 1 percent were pediatric cases where the mother was an IVDU or a sex partner of an IVDU (378). More than 54 percent of all heterosexual transmission cases and 52 percent of all pediatric transmission cases involved sexual partners of IVDU's (CDC 1993a; figure 4.3).

4.4.4.4 Costs of Treating Patients Infected With Human Immunodefiency Virus

During the past decade, the total direct costs of treating all persons who are HIV positive have increased dramatically. Estimates have ranged from $630 million in 1985 (Scitovsky and Rice 1987) to $3.3 billion in 1989 (Hellinger 1990) to $5.8 billion in 1991 (Hellinger 1991). The total cost of treating all persons who are HIV positive is estimated to have been $10.3 billion in 1992 (Hellinger 1992). This number may be inflated, however, because of a $20,000 decrease in treatment cost estimates from 1992 to 1993 (Hellinger 1993). With approximately 36 percent of all HIV infections attributed to intravenous drug use, the total direct costs attributed to drug abuse were $3.7 billion. However, these figures may underestimate the cost of treatment for IVDU's. IVDU's are likely to be more dependent on the health care system for services than other persons. Not only are IVDU's generally sicker when they enter the system, but they are also less likely to have a support network of family and friends (Nichols 1989). Without a strong support network, IVDU's are more likely to use hospital and other home-health care services, resulting in higher direct medical costs.

Figure 4.3
Number of Persons Diagnosed With AIDS by Intravenous Drug-Related Risk Group, by Year of AIDS Diagnosis, 1985–1996



SOURCE: CDC, HIV/AIDS Surveillance, year-end editions, 1993–1997.

Several studies were conducted to estimate the cost of treating a person with AIDS. Estimates of lifetime treatment costs have ranged from $70,000 in 1985 (Scitovsky and Rice 1987) to $147,000 in 1985 (Hardy et al. 1988) to $140,000 in 1992 (Hellinger 1993). Hellinger (1993) estimated that the annual cost of treating an individual from the onset of infection to death was $119,274. These costs have decreased during the years as new treatments and therapies have been successful in transforming HIV from an acute illness that necessitates frequent hospitalizations to a chronic illness with long periods of low-intensity care and fewer hospitalizations.

To understand the full impact of the direct medical costs of AIDS on the health care system, the total costs from the onset of HIV infection to death must be computed. The cost of treatment can be broken down into four phases: Phase 1 represents persons who are asymptomatic, phases 2 and 3 primarily represent persons who are symptomatic, and phase 4 represents persons with AIDS.

For each phase of HIV infection, Hellinger estimated the monthly cost for inpatient, outpatient, home-health, drug, and long-term care costs. Monthly costs were derived by multiplying the average length of stay, average number of hospitalizations, and average cost per day. The increase in treatment costs as the disease progresses through phase 4 is a reflection of the higher proportion of inpatient episodes (i.e., increases in the average length of stay and average number of hospitalizations) (see table 4.17).

According to the AIDS Cost and Service Utilization Survey data, the average total time from HIV infection to death is 149 months or 12.4 years, with a survival time for phase 4 of 25 months (Hellinger 1993). By multiplying the mean duration of each phase by its respective total cost per month, the estimated total lifetime cost of care for a person infected with HIV is $119,274 (see table 4.18).

Table 4.17

Total Monthly Cost of Treating Person With HIV by Disease Stage

(1992 dollars)

Type of Care	**Phase 1**	**Phase 2**	**Phase 3**	**Phase 4**
	HIV Positive Without AIDS **(T-Cell Count ≥ 0.5 x 10^9/L)**	**HIV Positive Without AIDS** **(T-Cell Count ≥ 0.2 x 10^9L and < 0.5 x 10^9/L)**	**HIV Positive Without AIDS** **(T-Cell Count < 0.2 x 10^9/L)**	**Persons With AIDS**
Inpatient	$54	$119	$456	$1,890
Outpatient visits	$151	$191	$344	$380
Home health	$10	$21	$80	$174
Drug costs	$67	$99	$110	$265
Long-term care	$0	$0	$0	$55
Total Costs	**$282**	**$430**	**990**	**$2,764**

SOURCE: Hellinger (1993).

NOTE: Components may not sum to totals because of rounding.

Table 4.18

Total Lifetime Cost of Treatment for HIV Infection From Onset to Death

(1992 dollars)

Disease Stage	Mean Duration of Phase (months)	Cost per Month	Total Cost of Care
HIV positive without AIDS (phase 1) (T-cell ≥ 0.5 x 10^9/L)	67.3	$282	$18,978
HIV positive without AIDS (phase 2) (T-cell count ≥ 0.2 and < 0.5 x 10^9/L)	44.0	$430	$18,920
HIV positive without AIDS (phase 3) (T-cell count < 0.2 x 10^9/L)	12.4	$990	$12,276
Person with AIDS (phase 4)	25.0	$2,764	$69,100
Course of Illness	**148.7**	**$4,466**	**$119,274**

SOURCE: Derived from Hellinger (1993).

NOTE: Components may not sum to totals because of rounding.

As previously indicated, direct medical expenditures for the treatment of HIV and AIDS attributed to drug abuse are substantial. However, other "indirect" medical costs also add to the economic burden the epidemic is placing on the health care system. For example, the American Red Cross currently screens all 12 million donated units of blood for HIV antibodies (Wallace et al. 1993). In addition, more indirect medical costs arise as practitioners and other health care personnel take extensive precautions to avoid infection through contamination by HIV-positive blood.

IVDU's are highly dependent on public insurance and indigent care to fund medical expenses associated with treatment for HIV infection and AIDS. Hellinger (1993) reported that overall, approximately 40 percent of all AIDS patients receive Medicaid payments during some part of their illness. Federal and State Medicaid expenditures for treating persons with AIDS were approximately $2 billion in 1992, while Medicare expenditures were $280 million (Hellinger 1993).

Scitovsky (1991) found that the degree to which the Government subsidizes treatment for AIDS is most evident in public hospitals, where 83 percent of all AIDS admissions are Medicaid or self-pay. Hospitals frequently provide "free care" to persons who have no insurance or funds to cover the expenses. Based on a nationwide survey of AIDS patients at acute care hospitals, the average loss at public hospitals per AIDS patient was $5,818 (1987 dollars) per year. Since IVDU's and sexual partners of IVDU's are less likely to have private insurance than other patients with HIV infection, the uncompensated care burden on both public and private hospitals is substantial.

4.4.5 Hepatitis B and Hepatitis C Infection

Drug abuse-related behaviors are estimated to cause 12 percent of hepatitis B (HBV) cases and 36 percent of hepatitis C (HCV) cases each year. The cost of treatment for drug abuse-related HBV and HCV cases in 1992 is estimated to be $462.4 million.

4.4.5.1 Synopsis

In 1992, approximately 200,000 to 300,000 new acute hepatitis B (HBV) infections and 170,000 new acute hepatitis C (HCV) infections occurred. Using these estimates, the total estimated cost for treating acute HBV and HCV cases was almost $271.5 million and almost $1,193.8 million, respectively. Approximately 12 percent of HBV and 36 percent of HCV cases diagnosed during 1993 were related to intravenous drug abuse. Accordingly, the estimated cost of drug abuse reflected by HBV and HCV treatment is $32.6 million and $429.8 million, respectively, for a total of $462.4 million in 1992.

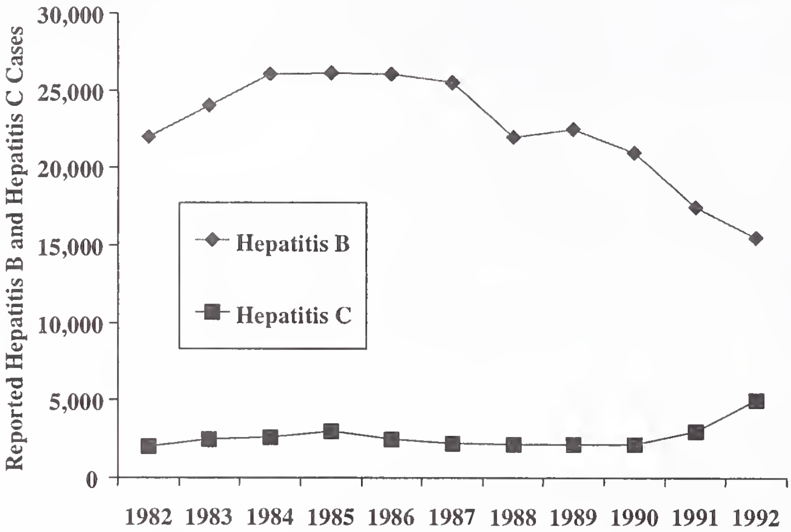
The much greater cost for HCV infection is because more cases of HCV infection become chronic than is the case with HBV (50 percent compared with less than 10 percent). If current trends continue and the incidence and prevalence of HCV continues to rise, the burden on the health care system will increase because 50 percent of persons who contract HCV are predicted to experience long-term, chronic health problems.

4.4.5.2 Hepatitis B and Hepatitis C Virus

The annual number of HBV cases reported to CDC has decreased since the early 1980's (see figure 4.4). The decrease, however, has been modest (38 percent since 1982) considering that a safe and effective vaccine for HBV was introduced in the United States in 1981. CDC annual infection estimates are derived using a factor based on a comparison of active versus passive surveillance of HBV and HCV cases (Alter et al. 1987; CDC 1993c, personal communication). In 1992, there were 16,126 new HBV cases reported to the CDC. According to the most recent CDC estimates, approximately 200,000 to 300,000 new acute HBV infections occur annually. More than 50 percent of new acute cases are asymptomatic (CDC 1993c, personal communication).

Approximately 6 to 10 percent of persons older than age 5 who contract acute HBV each year become chronic carriers (CDC 1993c; Sherlock 1987). Chronic carriers are defined as persons who are seropositive for HBsAg (hepatitis B surface antigen) for more than 6 months (Sherlock 1987). Chronic carriers can either remain "healthy" or develop various forms of chronic hepatitis, cirrhosis, or primary hepatic cancer. These numbers are inversely proportional to age, as the risk of chronic infection for infants who acquire infection during the prenatal period is 70 to 90 percent (Shapiro 1993). Males with acute HBV infection are also six times more likely than women to become chronic carriers (Sherlock 1987). Roughly 1 million persons are chronic carriers of the HBV (CDC 1993c).

Figure 4.4
Reported Hepatitis B and Hepatitis C Cases, 1982–1992



SOURCE: CDC (1993b).

NOTE: The HCV numbers were derived from the number of non-A, non-B hepatitis (NANB) cases reported to CDC. Approximately 80 percent of NANB cases are HCV.

In contrast to HBV trends, the number of reported HCV cases has been increasing during the past several years (see figure 4.5). As with HBV, annual incidence estimates are derived by extrapolating the total number from the actual number of HCV cases reported to the CDC. According to the most recent CDC estimates, 170,000 new infections occur annually (CDC 1993c). Approximately two-thirds of all acute HCV cases are either asymptomatic, mild, or hard to detect (National Hepatitis Detection and Treatment Program 1991). Acute episodes of HCV are generally less severe than acute episodes of HBV. In contrast to HBV, approximately 50 percent of acute HCV cases (85,000) become chronic.

The most common mode of infection for HBV is sexual contact, with intravenous drug use and perinatal transmission accounting for the majority of the remaining reported cases in which risk was identified. As seen in the AIDS epidemic, the proportion of total HBV cases involving heterosexual contact is rising, while the number of cases reported through homosexual transmission is decreasing (CDC 1993c). This trend appears to be associated with behavior modification among homosexual men in response to the AIDS epidemic. From 1981 to 1987, the number of reported cases of HBV through intravenous drug use increased 77 percent (Bloom et al. 1993). However, over the past several years, the percentage of HBV cases attributed to intravenous drug use has decreased from between 24 and 29 percent in the mid-1980's to 12 percent in 1993 (Alter et al. 1990b; CDC 1993c).

HCV is most commonly transmitted through intravenous drug use and blood transfusions and is rarely acquired through sexual contact. In contrast to the epidemiological trends of HBV, the proportion of reported HCV cases acquired through intravenous drug use remains very high (12 percent versus 36 percent, respectively). The risk of acquiring HCV through intravenous drug use also increases as the duration and frequency of drug use increases. According to an Australian study, approximately 66 percent of IVDU's acquire HBC within 2 years of regular intravenous drug use, and virtually 100 percent of IVDU's acquire HCV within 8 years of regular use (Bell 1990). The results of this study, however, should be used with caution because characteristics of IVDU populations (such as needle sharing) have been shown to vary across and within countries.

HBV has been identified as a major cause of cirrhosis and primary hepatic cancer. Associations between HCV and primary hepatic cancer have also been identified. For example, between 20 to 40 percent of persons with chronic HCV will develop cirrhosis (National Hepatitis Detection and Treatment Program 1991). Although many persons with cirrhosis do not exhibit symptoms initially, there is a high mortality rate due to eventual hepatic decomposition. Beasley (1988) reported that persons with cirrhosis are more likely than carriers or persons with chronic active hepatitis to develop primary hepatic cancer. Beasley also noted that international studies have shown that HBV is a major etiologic agent for primary hepatic cancer in 75 to 90 percent of cases.

4.4.5.3 Relationship Between Intravenous Drug Use, HBV, and HCV

IVDU's contract HBV and HCV by sharing contaminated needles. Studies have shown that IVDU's are at high risk to acquire HBV and HCV, as seroprevalence rates range from 65 to 90 percent (Bailly 1989; Piot et al. 1990). During 1993, 12 percent of HBV infections (Shapiro 1993) and 36 percent of HCV infections were attributed to persons who use intravenous drugs (CDC 1993c). These estimates may be conservative, because at least 30 percent of adults who reported HBV and HCV cases did not specify a risk factor (Shapiro 1993; CDC 1993c). It is possible that some persons with unidentifiable risk factors were reluctant to identify intravenous drug use as a risk factor.

As in HIV infection, IVDU's infect not only other IVDU's but also their sexual partners. Transmission of HBV through heterosexual activity has been increasing each year, and perinatal transmission of HBV by mothers who use intravenous drugs or have sexual intercourse with an IVDU is common, with transmission rates reaching 90 percent (Arevalo and Washington 1988). Sexual and perinatal transmission of HCV is rare, however (Piot et al. 1990).

The public health concerns regarding HBV and HCV are justified. NIDA estimates from the 1992 U.S. Household Survey on Drug Abuse indicate that 660,000 persons reported intravenous drug use within the month preceding the survey and 3 million persons reported use during their lifetimes (SAMHSA 1993b). The survey does not cover the more than 1 million prisoners (U.S. Department of Justice 1993a) or 500,000 to 650,000 homeless persons (Burt and Cohen 1989). Most IVDU's are believed to be on the East Coast, with the largest concentration (250,000) reported in New York City (Jaffe 1992). Because of the transient nature of the IVDU population, however, it is difficult to make reliable estimates.

4.4.5.4 Costs of Treating Patients Infected With Hepatitis B and Hepatitis C

The cost of treating HBV reported by Bloom et al. (1993) is used in this report to estimate per-case treatment costs resulting from intravenous drug abuse-related HBV and HCV cases. The study builds cost estimates from the expected course of HBV during its acute phase (experienced by all cases) and the chronic phase (experienced by a small proportion of all cases). Bloom's estimates, reported in 1989 dollars, were inflated to 1992 dollars using the medical care component of the consumer price index (CPI) (see table 4.19). Data were not available on the average cost for treating an acute HCV case; accordingly, the HBV cost estimates were also applied to HCV (see table 4.20). However, it is clear that acute cases of HCV are more serious than HBV, suggesting that application of the HBV costs to HCV may underestimate the actual value of services provided to HCV victims.

Using these estimates, the total estimated cost for treating acute HBV and HCV cases was almost $271.5 million and almost $1.2 billion, respectively. If intravenous drug abuse caused 12 percent of the HBV cases and 36 percent of the HCV cases, then the cost of drug abuse reflected by HBV and HCV treatment is $32.6 million and $429.8 million respectively, for a total of $462.4 million in 1992. The much greater cost for HCV infection is due to the fact that more cases of HCV infection become chronic than is the case with HBV (50 percent compared with less than 10 percent).

Table 4.19

Treatment Costs per Acute Hepatitis B Virus Case

Disease Stages/Conditions	Probability of Stage (%)	Number of Cases in 1992	Cost per Case in 1992 (dollars)	Total HBV Treatment Expenditures (millions of dollars)	Total IVDU-Related HBV Expenditures (millions of dollars)
Acute Disease Only					
Subclinical	65.7	131,400	$6	$0.8	$0.1
Clinical, nonfulminant	34.0	68,000	$703	$47.8	$5.7
Fulminant	0.3	600	$12,124	$7.2	$0.9
Subtotal, Acute	*100.0*	*200,000*	*NA*	*$55.9*	*$6.7*
Chronic Disease					
Chronic carrier state	3.9	2,657	$950	$2.5	$0.3
Chronic persistent state	2.0	1,363	$1,618	2.2	$0.3
Chronic active hepatitis	2.6	1,771	$67,486	$119.6	$14.3
Primary hepatic cancer	1.3	886	$103,148	$91.4	$11.0
Subtotal, Chronic	*NA*	*6,677*	*NA*	*$215.6*	*$25.9*
TOTAL, All Conditions				**$271.5**	**$32.6**

SOURCE: Bloom et al. (1993).

NOTE: Components may not sum to totals because of rounding. Intravenous drug use is estimated to cause 12 percent of hepatitis B (HBV) cases.

Table 4.20

Treatment Costs per Acute Hepatitis C Virus Case

Disease Stages/Conditions	Probability of Stage (%)	Number of Cases in 1992	Cost per Case in 1992 (dollars)	Total HCV Treatment Expenditures (millions of dollars)	Total IVDU-Related HCV Expenditures (millions of dollars)
Acute Disease Only					
Subclinical	65.7	111,690	$6	$0.7	$0.3
Clinical, nonfulminant	34.0	57,800	$703	$40.6	$14.6
Fulminant	0.3	510	$12,124	$6.2	$2.2
Subtotal, Acute	***100.0***	***170,000***	***NA***	***$47.5***	***$17.1***
Chronic Disease					
Chronic carrier state	24.9	14,420	$950	$13.7	$4.9
Chronic persistent state	12.5	7,239	$1,618	$11.7	$4.2
Chronic active hepatitis	16.3	9,440	$67,486	$637.1	$229.3
Primary hepatic cancer	8.1	4,691	$103,148	$483.9	$174.2
Subtotal, Chronic	***NA***	***35,790***	***NA***	***$1,146.3***	***$412.7***
TOTAL, All Conditions				**$1,193.8**	**$429.8**

SOURCE: Bloom et al. (1993).

NOTES: Components may not sum to totals because of rounding. Intravenous drug use is estimated to cause 36 percent of hepatitis C (HCV) cases. Total probability of chronic disease stage (50 percent) is less than the sum of specific categories because more than one category of chronic stage is possible with any given case.

4.4.6 Psychiatric Comorbidity

4.4.6.1 Synopsis

These preliminary estimates suggest that the cost of treating alcohol and drug abuse-induced psychiatric disorders in 1992 may have been as high as $3.06 billion. This amount accounts for 9.5 percent of total expenditures for specialty sector mental health care in 1992. Of the $3.06 billion, $1.92 billion was spent on mental health disorders attributed to alcohol abuse and $1.14 billion on mental health disorders attributed to drug abuse. These estimates have not been included in totals of this report because of the limited amount of research and data on this issue. The estimates have been calculated, however, to demonstrate the plausible order of magnitude of such costs and to highlight the importance of further research.

The $3.06 billion estimate was derived in a two-step process: first, estimating the number of cases attributable to alcohol and drug abuse and second, applying an average cost. One-half of the number of comorbid cases (i.e., cases in which a patient is diagnosed as having a primary mental disorder with a secondary alcohol or drug use disorder) in mental health treatment settings was used for the number of episodes. The average cost per case for the setting of care was then calculated and applied to the estimated case count by setting of care. Prior studies have estimated that on average, 5 percent of patients in specialty mental health settings have a primary alcohol and drug abuse/dependence diagnosis, for which they are presumably receiving primary alcohol and drug abuse treatment. Based on a review of the comorbidity literature, this study finds that it is plausible that one-half the remaining comorbid admissions in mental health (after netting out the primary alcohol and drug abuse treatment cases) may have been caused by alcohol and drug abuse.

There has been recognition that a significant number of people presenting to specialized mental health providers have a primary diagnosis of alcohol and drug abuse. However, the economic implications of large numbers of persons with primary mental health diagnoses who also have alcohol or drug abuse problems have received little analysis or acknowledgement.

A review of the literature finds a dearth of research on the nature and direction of the relationship between mental disorders and alcohol or drug abuse. Some limited studies find evidence that particular patterns of alcohol and drug abuse (types of substances) may contribute to or cause certain mental disorders (and vice versa). These mental health disorders can be temporary or long term in duration. Moreover, alcohol or drug abuse may exacerbate existing mental disorders, causing them to worsen to the point that people must seek mental health care.

The limited research into psychiatric and alcohol and drug abuse comorbidity has concluded that both mental health and alcohol or drug abuse treatment settings must address comorbidity in their client populations and recognize the relationship between the two co-occurring disorders. Mental health and alcohol and drug abuse treatment systems need to be working toward treating both disorders.

4.4.6.2 Prevalence of Comorbid Psychological and Alcohol and Drug Abuse Disorders

4.4.6.2.1 Comorbidity in General Population

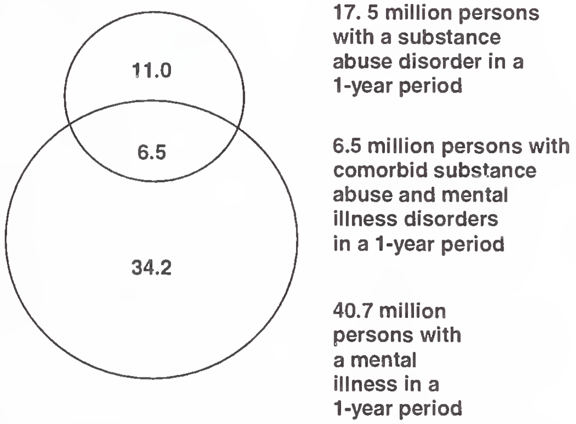
This section of the study defines psychiatric comorbidity as a condition of an individual who simultaneously has one or more mental disorders plus an alcohol or drug abuse disorder. The prevalence of psychiatric comorbidity in the general U.S. population has been found to be higher than previously thought (Kessler et al. 1994). The two major data sets that focus on comorbidity are the National Comorbidity Survey (NCS) and the Epidemiologic Catchment Area (ECA) Study. Although each study employed rigorous methods to detect psychiatric symptomatology or a disorder, neither study collected much information about the timeframes during which these symptoms occurred. For alcohol and drug use disorders, it is only possible to report, for example, that an individual had particular symptoms in the past year and not whether the disorders were present or whether they preceded other mental disorders. Moreover, while the ECA was not based on a nationally representative sample, it did look within communities at both the general population and clinical populations. The NCS employed a nationally representative sample.

The NCS found that almost 50 percent of respondents reported at least one lifetime DSM–III–R-defined psychiatric disorder. More than one-half of all lifetime disorders occurred in the 14 percent of the population who had a history of three or more comorbid disorders. Nearly 30 percent of respondents reported at least one disorder in the 12 months before their interviews. Fifty-six percent of the respondents with a history of at least one disorder had two or more disorders. The major burden of a psychiatric disorder in this sector of our society is concentrated in a group of highly comorbid people who constitute about one-sixth of the population (Kessler et al. 1994).

The ECA data showed that estimated U.S. population lifetime prevalence rates were 22.5 percent for mental disorders not associated with alcohol or drug abuse, 13.5 percent for alcohol dependence/abuse, and 6.1 percent for other drug dependence/abuse. Among those with an alcohol disorder, 36 percent had a comorbid mental disorder. The highest mental-addictive disorder comorbidity rate was among those with drug (excluding alcohol) disorders, with 53 percent of this population found to have a mental disorder (Regier et al. 1990).

Figure 4.5 illustrates the number of persons affected by mental illness, alcohol, and drug abuse along with comorbid alcohol and drug abuse and mental health disorders in a 1-year period. In 1 year, 6.5 million people were affected by comorbid alcohol and drug abuse and mental illness disorders. These persons sought treatment in mental health and/or alcohol and drug abuse treatment settings (Narrow et al. 1993).

Figure 4.5
One-Year Prevalence of Alcohol and Drug Abuse and Mental Illness Among U.S. Adults


11.0
6.5
34.2
17. 5 million persons with a substance abuse disorder in a 1-year period
6.5 million persons with comorbid substance abuse and mental illness disorders in a 1-year period
40.7 million persons with a mental illness in a 1-year period

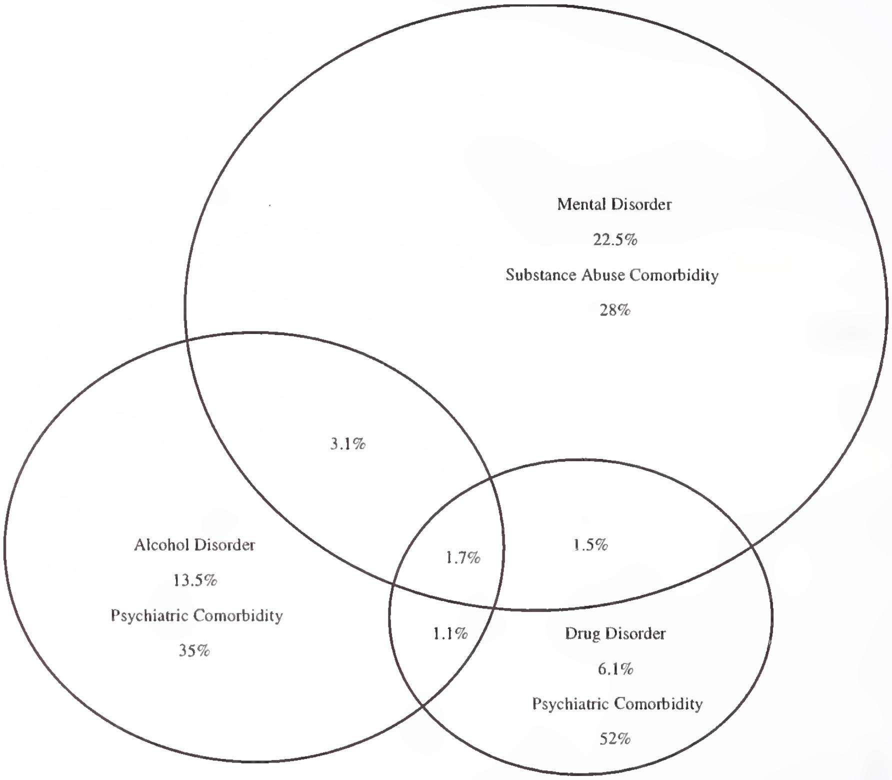
SOURCE: Narrow et al. (1993).

NOTE: Data are extrapolations based on a nonrepresentative sample.

Many alcohol and drug abusers have a comorbid psychiatric disorder. The graph in figure 4.6 represents ECA community and institutional data that were standardized to the U.S. population. ECA estimates suggest that 52 percent of drug abusers and 35 percent of alcohol abusers had a psychiatric disorder. Twenty-eight percent of persons with a psychiatric disorder experienced either an alcohol abuse or drug abuse disorder. ECA data on the magnitude of psychiatric comorbidity among alcohol and drug abusers have been replicated by the more recent National Comorbidity Survey data (Kessler et al. 1994) and provide a reason to continue to explore the relationships that exist among co-occurring psychiatric and alcohol and drug abuse disorders.

Figure 4.6 demonstrates that 22.5 percent of the general population have had a mental disorder during their lifetime, of whom 28 percent also have had an alcohol and drug abuse problem. Of the 13.5 percent of the general population who have had an alcohol abuse disorder during their lifetime, 35 percent also had a psychiatric disorder during their lifetime. Finally, of the 6.1 percent who have had a drug abuse disorder, 52 percent had a psychiatric comorbidity during their lifetime. A significant limitation to these data, however, is that one could encounter and recover from a disorder years before another disorder occurred, with no relationship between the two. It is important, therefore, to examine the prevalence of alcohol and drug abuse and psychiatric comorbidities among current clinical populations.

Figure 4.6
Lifetime Prevalence of Comorbid Mental and Addictive Disorders in the United States



SOURCE: Regier et al. (1990).

4.4.6.2.2 Comorbid Problems in Treatment Settings

Studies of inpatient and outpatient psychiatric populations found that comorbid psychiatric disorders occur in 30 to 50 percent of the alcohol and drug abuse treatment population; some estimates suggest that up to 80 percent of alcohol and drug abusers in treatment have psychiatric symptoms (Kosten and Kleber 1988). Other studies show that 50 to 75 percent of general psychiatric treatment populations have alcohol or drug disorders (Miller and Gold 1991). Galanter et al. (1988) reviewed the literature on patients presenting for general psychiatric treatment who are also alcohol and drug abusers and concluded that alcohol and drug abuse plays a prominent role in leading to the admissions of a majority of patients in acute psychiatric settings.

The ECA study (Narrow et al. 1993) examined the number of persons who accessed ambulatory mental health/addictive services with a diagnosis of a mental health disorder who also had an alcohol or drug abuse disorder (see table 4.21). The values ranged from 13 to 40 percent, with most of the values between 20 and 30 percent.

Table 4.21

Ambulatory Mental Health Patients With Alcohol or Drug Abuse Disorders

Ambulatory Mental Health Settings	Percent (N = 1,904)
Psychiatric hospital outpatient clinic	25.2
Mental health center outpatient clinic	18.4
General hospital outpatient clinic	19.0
VA hospital outpatient clinic	40.6
Alcohol/drug unit outpatient clinic	35.0
Mental health specialist in health plan/clinic	17.7
Mental health specialist in private practice	16.1
Crisis center	28.0
Emergency department	41.9
General medical physician	15.2
Family/social service agency	14.6
Clergy/religious counselor	13.5
Natural therapist	29.1
Other human services	23.6
Self-help group	33.2
Friend/relative	15.4

SOURCE: Narrow et al. (1993).

NOTE: VA = Veterans Affairs.

Table 4.22 also illustrates the percentage of mental health and alcohol and drug abuse clients with a comorbid disorder treated in inpatient facilities (mental health or general). The proportion of alcohol and drug abusers who have a co-occurring psychiatric disorder is higher than the proportion of persons with a psychiatric disorder who also have an alcohol or drug abuse disorder. However, small cell sizes for some estimates on the right-hand side of the table (mental disorders among persons with an alcohol or drug abuse disorder) suggest caution in interpretation of these estimates and highlight the need for continued research.

Table 4.22

Comorbidity Among Inpatient/Residential Patients Treated in Specialty Mental Health/Alcohol and Drug Abuse Settings

Persons With a Mental Disorder Who Also Have an Alcohol and Drug Abuse Disorder		**Persons With an Alcohol and Drug Abuse Disorder Who Also Have a Mental Disorder**	
Inpatient Setting	**%**	**Inpatient Setting**	**%**
General hospital (psychiatric unit and scatter-bed)	39.3	General hospital (psychiatric unit and scatter-bed)	72.9
State and county mental hospitals	22.1	State and county mental hospitals	95.0
Residential supportive care	27.7	Residential supportive care	98.6
Community mental health center	1.2	Community mental health center	81.0
Private mental hospital	19.3	Private mental hospital	77.7
VA hospital psychiatric unit	77.7	VA hospital psychiatric unit	82.1
Alcohol/drug treatment unit	56.8	Alcohol/drug treatment unit	97.4
Nursing home	15.6	Nursing home	100.0

SOURCE: Analysis of Narrow et al. (1993) by The Lewin Group.

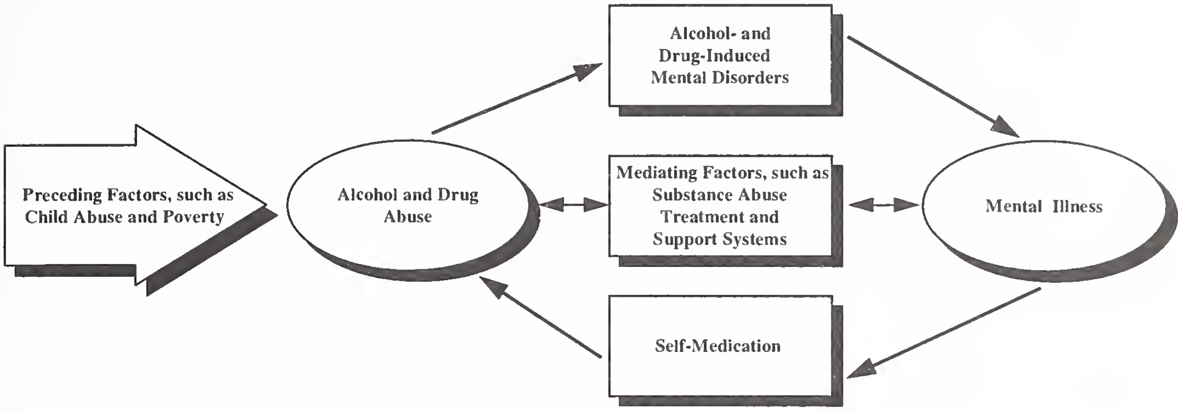
NOTE: VA = Veterans Affairs.

4.4.6.3 Research Into Causal Connections Between Psychiatric and Alcohol and Drug Abuse Disorders

Epidemiologic research indicates that alcohol or drug abuse disorders co-occur with psychiatric disorders at a rate exceeding that predicted by chance alone, suggesting that the co-occurrence between these conditions is neither random nor coincidental. The research, however, often does not clarify the nature of the relationship between the two conditions. The literature can be divided between those who suggest that alcohol or drug abuse may cause mental illness or symptoms generally indistinguishable from mental illness, and those who suggest mental illness may motivate individuals to abuse drugs or alcohol. The latter includes "self-medication" hypotheses. The objective of this study was to articulate the causal hypotheses referred to above, review the studies that have attempted to examine these causal hypotheses, and determine the cost of comorbid psychiatric and alcohol or drug abuse disorders in mental health treatment settings.

Drug and alcohol abuse are not limited to any specific group of psychiatric disorders, though they are more common among some disorders than others. Although alcohol- and drug-abusing schizophrenic persons occupy much of the time and energy of the U.S. mental health system, affective and anxiety disorders are much more common among alcohol and drug abusers (Kosten and Kleber 1988). These affective and anxiety disorders may lead to drug or alcohol abuse through efforts at self-medication, or they may result from chronic alcohol or drug abuse and be mimicked by acute intoxication (NIDA 1991a). The two causal theories are not necessarily mutually exclusive and may each play a role in the presentation of alcohol or drug abuse and mental illness comorbidity. Importantly, other factors may predispose individuals to both disorders (e.g., childhood experiences), as identified in figure 4.7.

Figure 4.7
Variable Relationships of Causality Among Comorbid Disorders


Alcohol- and Drug-Induced Mental Disorders
Preceding Factors, such as Child Abuse and Poverty
Alcohol and Drug Abuse
Mediating Factors, such as Substance Abuse Treatment and Support Systems
Mental Illness
Self-Medication

Hypothesis 1: Mental illness can cause alcohol and drug abuse.

One source of evidence that suggests mental illness can cause alcohol and drug abuse is age-of-onset data from the ECA study. The ECA data provided evidence from retrospective self-reports by community residents of the importance of early onset of major mental disorders, especially anxiety disorders. The data included a subgroup of 4,778 respondents, ages 18 to 30, from 18,572 household respondents.

The findings demonstrated a doubling of risk for subsequent alcohol or drug abuse disorders in young adults who had an earlier depressive or anxiety disorder (see table 4.23). Similar findings are found in the work of Deykin et al. (1987), who concluded that the onset of a major depressive disorder almost always preceded alcohol or drug abuse among a sample of 424 college students ages 16 to 19. These empirical observations, however, do not address the possibility that before some people meet criteria for alcohol and drug abuse disorders, they are experimenting with or using drugs and alcohol. Initiation of licit and illicit drug use begins in early adolescence in the general population (NIDA 1990).

The self-medication hypothesis is widely used to account for high comorbidity rates between alcohol or drug abuse and psychiatric disorders. The self-medication hypothesis states that people are motivated to use drugs or alcohol to relieve psychiatric problems (Khantzian 1985). Consistent reports from patients that alcohol is used primarily to relax and relieve dysphoria suggest that the goal of self-medication spans a range of psychiatric disorders (NIAAA 1993).

Table 4.24 shows research studies that have produced findings in support of the self-medication hypothesis. The self-medication hypothesis is a clinical paradigm that attempts to enable clinicians to better understand the nature of compulsive drug and alcohol use and provides a clinical construct for consideration of treatment alternatives (Khantzian 1985). Most support for this hypothesis has been based on clinical experience.

Table 4.23

Prevalence and Age at Onset of Alcohol Abuse, Drug Abuse, Major Depression, and Anxiety in the Epidemiologic Catchment Area Study

Disorder (Lifetime Diagnosis)	Prevalence (%)	Mean Age at Onset (years)
Alcohol abuse or dependence	13.3	23.2
Drug abuse or dependence	5.9	20.2
Major depressive episode with mania	0.5	19.3
Anxiety disorders	14.6	19.6

SOURCE: Christie et al. (1988).

Several researchers performed studies of narcotic addicts in inner-city New York in an attempt to understand the psychological effects of opiates and how they interacted with addicts' ego, superego, narcissism, and other psychopathology (Khantzian 1985). They posited that persons use drugs adaptively to cope with overwhelming adolescent anxiety in anticipation of adult roles in the absence of adequate preparation, models, and prospects. In the early 1970's, psychiatrists and psychologists began to study addicts within community treatment settings and their private practices.

One approach to the work placed a greater emphasis on psychological and psychiatric constructs in exploring the disturbances of addicts and understanding their suffering and subsequent addiction. This literature, based on case studies and a small sample of male inner-city opiate addicts, began to make a strong argument that psychiatric disturbances motivated opiate use to address acute and chronic anxiety (Khantzian 1985). Khantzian (1985) has concluded, based on clinical observations and psychiatric diagnostic findings of drug-dependent individuals, that drug abusers are predisposed to addiction because they suffer painful affect states and related psychiatric disorders. An addict's drug of choice is believed to be the result of an interaction between the psychopharmacologic action of the drug and the dominant painful feelings they feel. Based on clinical observations and psychiatric diagnostic findings of drug-dependent individuals, Khantzian believes narcotic addicts prefer opiates because of their powerful muting action on the disorganizing and threatening affects of rage and aggression. He also states that cocaine is an appealing drug of abuse because of its ability to relieve distress associated with depression, hypomania, and hyperactivity.

McLellan and Druley (1977) conducted a study that used the self-medication hypothesis as one explanation for patient selection of drugs with similar psychophysiological effects. McLellan reported that even though drugs may not have prevented the subsequent expression of drug abusers' psychiatric disorders, the drugs may have provided some temporary relief. These patients may have required or responded preferentially to particular drug combinations because of their underlying psychiatric symptoms. Given this self-medication explanation, the use of benzodiazepines and barbiturates by patients with underlying depression is believed to be understandable. Symptoms of anxiety, melancholy, and insomnia could be temporarily ameliorated by the anxiety-reducing, mood-elevating, and sleep-inducing effects of these drugs (NIDA 1991a).

Table 4.24

Studies on Mental Disorder-Induced Drug and Alcohol Abuse

Mental Illness Disorder	Relationship	Substance	Citation
Major depressive	Associated	Alcohol, drugs	Deykin et al. 1987
Social phobia	Associated	Alcohol	Judd 1994
Traumatic neurosis	Self-medication	Alcohol	Lacoursiere et al. 1980
Major depressive episode and anxiety	Associated	Drugs	Christie et al. 1988
Depression	Associated	Cocaine	Kosten et al. 1987
Depression, hypomania, and hyperactivity	Self-medication/self-selection	Cocaine	Khantzian 1985
Altered ego state	Associated/self-selection	Heroin	Milkman and Frosch 1973
Rage and aggression	Self-medication/self-selection	Heroin	Khantzian 1985
Depression	Supports self-medication	Opiates	Rounsaville et al. 1982
Premorbid adaptation	Self-selection	Amphetamines	Milkman and Frosch 1973

Other researchers have found supporting evidence for the self-medication argument. Milkman and Frosch (1973) tested the hypothesis that self-selection of specific drugs is related to personality style and found distinct personality styles led heroin addicts to prefer opiates and amphetamine addicts to use amphetamines. Other researchers maintained that drug users take drugs not only to assist in defending against their feelings, but also briefly to enable the experience of feelings such as oneness with loved objects, feelings that are normally prevented by the rigid defenses against aggression (Khantzian 1985).

The results of a study conducted by McLellan and Druley (1977) suggested a correlation between use of specific drugs and psychiatric diagnosis in hospitalized psychiatric patients. Abuse of amphetamines or hallucinogens was associated with a high proportion of paranoid schizophrenia diagnoses and a low incidence of depression diagnoses: Barbiturate abuse was associated with a high proportion of depression diagnoses and a low proportion of schizophrenia diagnoses. Rounsaville et al. (1982) produced outcomes that support the hypothesis that depressed addicts use opiates as an attempt at self-medication for intolerable, dysphoric feelings. Weiss et al. (1993) found that most patients reported they used drugs and alcohol in response to depressive symptoms and experienced mood elevation, regardless of their drug of choice. However, their findings neither confirm nor negate the self-medication hypothesis of alcohol and drug abuse.

Criticisms of the self-medication hypothesis have been made by Weiss et al. (1993), Bukstein et al. (1989), Dackis and Gold (1986), and Cappell and Herman (1972). Critics have asserted that the self-medication hypothesis data do not distinguish between psychiatrically induced addictive disorders and drug-induced psychopathology. The critics argue that self-medication theory is largely based on anecdotal data, collected from small numbers of patients who have been treated in psychotherapy. They conclude that much of the self-medication theory research does not produce convincing evidence that self-medication is an important dynamic in most alcohol and drug abusers.

Hypothesis 2: Alcohol and drug abuse can cause mental illness.

A significant amount of rigorously conducted research exists on the role alcohol and drug abuse play in mental illness. Most of these studies acknowledge a strong relationship between alcohol or drug abuse and mental disorders, and some of these studies report outcomes that support the hypothesis that drug or alcohol abuse can cause mental illness. However, it is important to understand that this supportive research does not state that specific types of alcohol and drug abuse *always* cause corresponding psychiatric disorders, but rather alcohol or drug abuse *can* cause mental illness (see table 4.25). The research provides evidence that alcohol and drug abusers have developed mental disorders as the result of their alcohol or drug abuse problems.

The 1991 NIDA report to Congress, *Drug Abuse and Drug Abuse Research,* focused a chapter on dual diagnosis. This chapter reviewed the literature and discussed studies that attempted to identify the population of dual-disordered patients and to describe the relationships between their drug of choice and their psychiatric symptoms.

In the previously discussed McLellan and Druley (1977) study of the relationship between comorbid drug abuse and mental disorders, McLellan found that significant psychiatric illnesses developed in the stimulant and depressant users groups. Two explanations were suggested for the increase in psychiatric symptoms within the two groups. McLellan established for the first time that there was evidence of measurable personality alterations associated with and specific to the chronic use of particular street drugs. One hypothesis stated that prolonged abuse of a specific combination of street drugs played a direct causal role in the resulting psychiatric disorders. This hypothesis suggested that regular consumption of particular street drugs may have hastened the development of psychiatric disorders (NIDA 1991a).

Crowley et al. (1974) suggested that drug abuse plays a prominent role in leading to the admissions of a large portion of patients into acute psychiatric services. They found that more than one-third of the adults in a psychiatric hospital had drug and alcohol abuse problems. Atkinson's research of patients seen in a psychiatric emergency service found that drugs and alcohol caused psychiatric symptoms in more than one-half of the cases, with alcohol alone in 20 percent, drugs alone in 21 percent, and both together in 12 percent of the admissions (Galanter et al. 1988). The works of Crowley et al. (1974) and other researchers strongly suggested that drug abuse played a prominent role in leading to the admissions of approximately one-third of the patients receiving acute psychiatric services (Galanter et al. 1988). Miller and Gold (1991) concluded that the acute and chronic actions of alcohol and drugs can produce symptoms similar to those found in psychiatric disorders, such as depression, anxiety, personality disorders, and psychosis.

Table 4.25

Studies on Drug and Alcohol Abuse-Induced Mental Illness

Drug Substance	Relationship	Mental Illness Disorder	Citation
Cocaine and amphetamine	Associated	Bulimia nervosa and anorexia nervosa	Hudson et al. 1992.
Cocaine and marijuana	Associated	Obsessive-compulsive disorder	Crum and Anthony 1993
Cocaine	Associated	Panic attacks	Rosen and Kosten 1992
Cocaine	Associated	Panic disorder	Louie et al. 1989
Cocaine and phencyclidine (PCP)	Can cause	Panic disorder	Price and Giannini 1987
Cocaine	Can cause	Panic disorder	Aronson and Craig 1986
Opiates	Associated	Major and minor depression	Croughan et al. 1982
Alcohol	Induce	Depression and temporary organic brain syndrome	Schuckit 1983
Alcohol	Associated	Depression	Powell et al. 1982
Alcohol	Associated	Depression	Schuckit 1986
Alcohol and drugs	Can produce	Depression, anxiety, psychoses, and personality disorders	Miller and Gold 1991
Phencyclidine (PCP)	Associated	Acute psychiatric exacerbations	Yago et al. 1981

Since McLellan's early work, there has been an increase in research examining the comoribidity relationship between alcohol or drug abuse and mental illness. Numerous studies of relatively small numbers of patients that identified what could be proposed as a causal link between specific abused substances and specific mental disorders have been carefully examined in a review by Kosten and Kleber (1988). These studies posit not that alcohol or drug abuse inevitably causes mental disorders but that specific drugs may result in a tendency for the development of mental disorders. They have identified the following patterns of drug- and alcohol-induced mental disorders:

- Users of stimulants, such as cocaine, generally present with agitated states during acute intoxication.
- Use of hallucinogens (including cannabis) can be associated with psychotic symptoms.
- A psychotic disorder can be precipitated by hallucinogens.
- Depression and mania can be either induced or mimicked by the pharmacological actions of stimulant abuse.

- Panic attacks can be induced by a variety of drugs.
- Solvents and anticholinergics can cause organic brain syndromes.

Another extensive review of literature on drug- and alcohol-induced organic mental disorders was conducted by Gold et al. (1985). They noted that the exact incidence and prevalence of these disorders is not known because it is an area of medicine and psychiatry that has been virtually ignored. Many of the studies are single-case reports, and the authors discuss the need for additional research in comorbid psychiatric and alcohol or drug abuse disorders. Tentative findings from these studies include the following:

- Adverse psychiatric reactions to marijuana and tetrahydroacannabinol (THC) included panic attacks and anxiety reactions.
- Depression severe enough to require psychiatric hospitalization has been reported in marijuana and THC users, along with acute toxic psychoses.
- Chronic opiate administration is associated with high rates of major and minor depressions. Acute effects of amphetamines are dose dependent and can include severe anxiety, panic, and acute psychoses.
- Acute toxic psychiatric effects often present as psychosis, mania, or extreme paranoia among cocaine abusers.
- Lysergic acid diethylamide (LSD) use is associated with severe panic and anxiety reactions, bipolar manic disorders, schizoaffective disorders, and major depressions.
- Inhalation of volatile fumes can have the following immediate effects: euphoria, hallucinations, conduct-disordered behavior, personality changes, irritability, anxiety, panic disorder symptoms, somatic complaints, fatigue, depression, and organic brain syndromes.
- Irritability and attacks of anger, depressed mood, and decreased social interaction may be seen in patients taking benzodiazepines or drinking alcohol.

4.4.6.4 Cost

To put the above data in perspective, it may be useful to examine the direct cost of treating mental health problems caused by alcohol and drug abuse. If alcohol and drug abuse are the underlying causes of a large amount of need for mental health treatment, then a share of the cost for these services could be attributed to both alcohol and drug abuse. Correspondingly, if underlying mental illness has caused patients to abuse drugs or alcohol, then some proportion of alcohol or drug abuse treatment services could be attributed to mental illness. The two types of cost allocations may ultimately offset each other, but it is also possible that the balance tilts more in one direction than the other. This balance may have implications for how policymakers and funders view financing of mental health and alcohol and drug abuse services.

Furthermore, treatment of comorbid mental health clients may be more complicated—and costly—than treatment of noncomorbid clients. A review in the *Eighth Special Report to the U.S. Congress on Alcohol and Health* (NIAAA 1993) found a series of studies concluding that patients with chronic psychiatric disorders complicated by alcohol or drug abuse have more problems than persons without alcohol and drug abuse complications. These problems include higher rates of relapse and rehospitalization, more admissions to emergency rooms, poor compliance with psychosocial and pharmacological interventions, and a history of arrests.

The research reviewed above clearly suggests that alcohol and drug abuse play important roles in contributing to, causing, and exacerbating mental disorders and may well contribute to increased admissions of persons with psychiatric disorders to mental health treatment settings. ECA data were examined to identify the percentage of patients in mental health settings who have a comorbid alcohol and drug abuse problem (Narrow et al. 1993). The following assumptions are used here to estimate the proportion of mental health expenditures that can be attributed to alcohol or drug abuse.

- Based on limited anecdotal information, it is assumed that approximately 5 percent of patients in mental health treatment settings are there primarily for alcohol or drug abuse disorders.
- One-half of the remaining comorbid population is assumed to have an alcohol or drug abuse problem that led to mental health treatment.

The best single source of information concerning expenditures for mental health services is the Inventory of Mental Health Organizations, which is summarized by the Center for Mental Health Services (Manderscheid and Sonnenschein 1994). Unfortunately, this source does not differentiate between outpatient and inpatient revenues for various types of providers (e.g., general hospitals). Accordingly, this study averages the estimated prevalence of alcohol and drug abuse disorders in psychiatric settings and applies the above-stated assumptions to derive a proportion of expenditures attributable to alcohol and drug abuse. In some cases, there was not a direct match between the ECA and Inventory of Mental Health Organization categories. For example, outpatient services from State and county mental hospitals were considered to be similar in attribution to private psychiatric hospitals. For "all other organizations," a simple average was calculated across all other settings and the same procedure used to infer attribution (subtract 5 percent and divide by 2).

These calculations suggest that as much as $3.06 billion in specialty-setting mental health treatment may have been delivered to patients seeking mental health treatment for a mental health disorder that was caused by an alcohol or drug abuse problem. This is about 9.5 percent of total mental health expenditures for the United States in 1992 (see table 4.16).

Allocations of these expenditures to drug and alcohol abuse, respectively, were based on the relative share of alcohol versus drug abusers with comorbid psychiatric disorders in the general population (refer to figure 4.6). Altogether, ECA data found that 6.3 percent of the population had a psychiatric disorder as well as an alcohol or drug disorder. Of these, 3.1 percent had a psychiatric disorder combined with an alcohol disorder (but not drugs), and 1.5 percent had a psychiatric disorder with a drug disorder (but not alcohol). The additional 1.7 percent had a psychiatric disorder as well as both alcohol and drug abuse disorders. This group was divided in proportion to the two prior values. It was estimated that 62.7 percent had an alcohol abuse-caused psychiatric disorder and 37.3 percent had a drug abuse-caused psychiatric disorder.

Therefore, of the $3.06 billion, $1.92 billion was spent on mental health disorders attributed to alcohol abuse and $1.14 billion on mental health disorders attributed to drug abuse.

Table 4.26

Costs of Mental Health Services Provided to Persons With an Alcohol- or Drug-Induced Mental Illness, 1992

(millions of dollars)

Type of Organization	Total Expenditures	Cases Attributed to Alcohol and Drug Disorders (%)	Cost Attributed to Alcohol or Drug Abuse
State and county mental hospitals	$8,797	9.3%	$820
Private psychiatric hospitals	$6,904	8.6%	$595
Non-Federal general hospitals with psychiatric services	$5,275	12.1%	$637
VA medical centers	$1,675	10.7%	$179
Residential treatment centers for emotionally disturbed children	$2,228	7.2%	$159
Freestanding psychiatric outpatient clinics	$759	6.7%	$51
All other organizations	$6,510	9.5%	$620
TOTAL	**$32,148**		**$3,062**

SOURCES: Narrow et al. (1993); Manderscheid and Sonnenschein (1994).

NOTE: Components may not sum to totals because of rounding.

4.4.6.5 Conclusion

Preliminary—and only indicative—estimates suggest that the cost of treating alcohol- and drug-induced mental disorders may be on the order of $3.1 billion, of which 62.7 percent, or $1.9 billion, is allocated to alcohol abuse and 37.3 percent, or $1.1 billion, is allocated to drug abuse. Because of the limited amount of study and evidence on the issue, we have elected to calculate, but not to total, these costs with other estimates of health care expenditures attributable to alcohol and drug abuse. It is hoped that this analysis will stimulate more research into this issue—an issue that probably has greater clinical importance than economic impact.

It is not necessary to assume that alcohol or drug abuse, or use, began before any symptoms of mental illness in order to attribute causal involvement in an episode of treatment for mental illness. Rather, alcohol or drug abuse may exacerbate (or temporarily obscure) symptoms of mental illness. Alcohol or drug abuse may well lead to admissions to mental health treatment.

Very little is known about the etiology of alcohol and drug abuse and psychiatric problems at the subclinical level. At the extreme, the common practice of drinking a few beers to alleviate stress at the office or in the home may start a process of negative coping behaviors that culminates when a person experiences serious problems. Much more must be learned about the gateways to chronic or severe alcohol and drug abuse and the pathways to mental illness.

4.4.7 Medical Consequences of Violent Crime

This study estimates that $505 million in medical expenses were incurred by victims of drug- or alcohol-induced violent crime in 1992, of which $400 million was related to alcohol-induced violence and $105 million was related to drug-induced or drug-related crime. Typically, violent crimes that require medical attention include injuries and traumas, such as beatings, fractures, stab wounds, and gun shots. This study already estimates that 10 percent of all such traumas treated at hospitals or on an outpatient basis are attributable to alcohol; thus, only the $105 million attributable to drug abuse is added separately. A full discussion of alcohol and drug abuse-related crime, including violent crime, is included in chapter 6, and the assumptions underlying this calculation are shown in appendix C, table 7.

4.5 Health Insurance Administration for Comorbid Health Conditions

In addition to the cost of care provided to persons with alcohol or drug abuse-specific or -related disorders are costs associated with administering public and private health insurance programs. The Health Care Financing Administration estimates that insurance administration represented 4.8 percent of total health expenditures in the United States. This study, therefore, calculated the additional cost of insurance administration to be 5.04 percent.[12] Applying this value to the subtotal of medical consequences of alcohol and drug abuse, respectively, yields $636 million in insurance administration costs attributed to alcohol and $265 million attributed to drug abuse.

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[12] 5.04 percent is based on the following calculation: [4.8%/(100%-4.8%)].

5. PRODUCTIVITY LOSSES

5.1 Synopsis

Alcohol and drug abuse cost society an estimated $176.4 billion during 1992 as a result of lost productivity resulting from premature death and illness among alcohol and drug abusers, associated crime-related costs of alcohol and drug abusers, time spent by alcohol and drug abusers in residential treatment, and developmental disabilities among fetal alcohol syndrome (FAS) survivors. An estimated $107 billion in overall productivity losses is attributable to alcohol abuse, and $69.4 billion is attributable to drug abuse (see table 5.1). The crime-related productivity losses include the value of lost potential productivity resulting from the following: (1) victimization by crime, (2) incarceration for a criminal offense, and (3) time spent by heroin and cocaine addicts in criminal activities (crime careers) rather than in legal employment.

The analysis of lost productivity in 1992 produced the following findings:

- More than 132,000 deaths were attributable to alcohol and drug abuse in 1992. The estimated loss of productivity resulting from these deaths was $45.9 billion (using a 6-percent rate of discount), including $31.3 billion for the 107,000 premature deaths attributable to alcohol abuse and $14.6 billion for the 25,000 deaths attributable to drug abuse.

- Alcohol and drug abuse can interfere with an individual's productivity and employment. Shortfalls in productivity and employment among individuals with alcohol and drug abuse disorders accounted for estimated losses of $80.9 billion in 1992, of which $66.7 billion is attributed to alcohol abuse and $14.2 billion is attributed to drug abuse.

- The estimated loss of potential productivity because of long-term residential treatment and short-term hospitalization of alcohol and drug abusers was $3 billion in 1992; drug problems cost $1.5 billion and alcohol problems, $1.5 billion. This estimate is somewhat conservative because it excludes time for hospitalization and recuperation associated with treatment for medical consequences of problem alcohol consumption.

- Adults who were born with FAS have mental impairments, which are associated with earnings lower than for adults who were not born with FAS. At a 1-in-1,000 incidence rate among adults, this results in an additional $990 million in lost earnings, all of which are alcohol caused.

- Victims of crime often experience loss of work time with the associated economic loss. An estimated 2.5 million alcohol-related victimizations (about 60 percent were assaults) occurred in 1992, with estimated costs of $1 billion. About 8.2 million drug-related victimizations occurred (about 75 percent were larcenies), with estimated victim work losses of about $2 billion.

- About 600,000 person-years of time spent in prisons and jails in 1992 (about 45 percent of the total time served in these facilities in 1992) is attributed to alcohol- (160,000 person-years, costing $5.4 billion) or drug-related crime (440,000 person-years, costing $17.9 billion).

The approximately 1.7 million "heavy" drug users often forsake the legitimate economy for the illicit drug trade or for careers in consensual (gambling and prostitution) or acquisitive (theft) crime, with losses of legitimate productivity of $19.2 billion.

Table 5.1

Lost Potential Productivity Due to Alcohol and Drug Abuse, 1992

(millions of dollars)

	Total	Alcohol	Drug
Lost Earnings due to:			
Premature death (mortality)	$45,902	$31,327	$14,575
Alcohol and drug abuse illness (morbidity)	$80,911	$66,706	$14,205
Institutionalized/hospital populations	$2,990	$1,513	$1,477
Fetal alcohol syndrome victims	$990	$990	NA
Victims of crime	$3,071	$1,012	$2,059
Incarceration	$23,356	$5,449	$17,907
Crime careers	$19,198	–	$19,198
TOTAL	**$176,418**	**$106,997**	**$69,421**

NOTE: Components may not sum to totals because of rounding. Mortality estimates use the present discounted value of expected lifetime productivity, discounted by 6 percent.

5.2 Mortality

5.2.1 Synopsis

Alcohol and drug abuse caused more than 132,000 deaths in 1992. The estimated loss of productivity resulting from these deaths was $45.9 billion using a 6-percent discount rate—107,000 alcohol-attributable deaths cost an estimated $31.3 billion, and 25,000 deaths due to drug abuse cost an estimated $14.6 billion. This study, using 1992 mortality and cost data, found that the number of deaths attributed to alcohol had increased 13 percent since the previous study conducted by Rice et al. (1990) using 1985 data. Alcohol-attributable deaths increased from 94,768 in 1985 to 107,360 in 1992. The number of deaths attributed to drug abuse alone increased by 20 percent, and when other drug abuse-related conditions (tuberculosis, AIDS, and hepatitis) were added, the number of drug abuse deaths tripled from 7,454 to 25,493. The number of deaths during 1985 estimated by Rice et al. (1990) was 50 percent higher than the estimate of Harwood et al. (1984) for 1980. Table 5.2 summarizes the number of deaths and cost effects for alcohol and drug abuse.

Economic costs were estimated using the "human capital" approach to valuation of loss of expected years of life and productivity that would been undertaken over the course of life. These values are dependent on the age and gender of the decedent to reflect both the life expectancy as well as expected value of market and nonmarket/household productivity. This approach is in contrast to the "willingness-to-pay" approach, which attempts to reflect both expected loss of productivity (the essence of the human capital approach) as well as the "value" of pain and suffering. Studies performed for the U.S. Department of Health and Human Services and the Public Health Service have predominantly used the human capital approach, although cost-benefit studies (for example, studies of highway safety and pollution control) often use the willingness-to-pay approach (Miller et al. 1991). Human capital values are materially lower than "typical" willingness-to-pay values and, thus, will yield "conservative" estimates for economic costs relative to estimates based on the willingness-to-pay approach. Most of the prior studies on the economic costs of alcohol and drug abuse have used the human capital approach (an exception is Miller et al. 1997a,b). It has never been addressed whether special willingness-to-pay estimates would be needed for alcohol and drug abuse.

The following sections report the numbers of deaths attributed to alcohol and drugs and the estimated economic costs of those deaths using the human capital approach.

Table 5.2

Total Number of Deaths and Economic Costs for Premature Mortalities Attributed to Alcohol and Drug Abuse, 1992

	Deaths	Economic Cost (millions of dollars)
Alcohol abuse	107,360	$31,327
Drug abuse	25,493	$14,575
TOTAL	**132,853**	**$45,902**

NOTE: Components may not sum to totals because of rounding. Economic cost is the present discounted value of expected lifetime market plus nonmarket productivity, discounted by 6 percent. Estimates are also presented later in this section for 3-percent and 4-percent discount rates.

5.2.2 Methodology for Estimating Deaths

This study uses the same approach employed in the studies by Rice et al. (1990) and Cruze et al. (1981). The approach entails:

- Identifying the causes of death (ICD-9 diagnoses) that can be entirely or partially attributed to alcohol and drugs,
- Obtaining estimates of appropriate "attribution factors" by diagnosis,
- Accessing data on the number of deaths for each diagnosis by age and gender group, and

- Applying economic values by age and gender group for the present discounted value of expected lifetime productivity.

Mortality data are from 1992, the year for which detailed estimates have been developed. This study estimates values using discount rates of 3 percent, 4 percent, and 6 percent and primarily uses the 6-percent values in order to remain consistent with Rice et al. (1990) and previous studies. The concepts of expected lifetime productivity and discounting are discussed earlier, in section 3.3.3, as well as following, in section 5.2.3.

5.2.2.1 Deaths Attributable to Alcohol Abuse

This study first identified the ICD-9 codes—listed as the primary cause of death—that, according to the most recent research, are attributable entirely or partially to alcohol abuse. As a first step in this analysis, a list of applicable diagnoses, the proportion of deaths attributable to alcohol for each diagnosis (as designated by the attribution factor, or AF), and the corresponding age ranges were drawn from *The Eighth Special Report to the U.S. Congress on Alcohol and Health* (National Institute on Alcohol Abuse and Alcoholism [NIAAA] 1993). This list was supplemented with data from a report published by NIAAA in 1993 (Stinson et al. 1993). The final list of diagnoses, along with respective AF values, was reviewed and supplemented slightly by NIAAA staff.

The number of alcohol-related deaths for each ICD-9 code was calculated by multiplying the AF for each diagnosis by the total number of deaths in the relevant age range indicating the particular ICD-9 code as the primary cause of death. Mortality data with detailed age and gender distributions by diagnostic code for 1991 were initially obtained from the most recent public-use National Center for Health Statistics (NCHS) ICD-9 mortality data series (see table 5.3). Subsequently, this study gained access to NCHS mortality estimates for 1992, which have been used to adjust the 1991 values (NCHS 1996b).

The parameters for the alcohol analysis differ only modestly from the Rice et al. (1990) analysis. This study includes some of the deaths related to diseases in four categories not included in the Rice et al. (1990) study that have been recently studied for their relationship with alcohol abuse. The net effect of these additional categories is an extra 10,900 deaths attributed to alcohol abuse in the current study than would have been counted using the categories employed by Rice et al. (1990). These additional four diagnoses are the following:

- Hypertension,

- Cerebrovascular disease,

- Chronic hepatitis, and

- Other chronic liver diseases.

In addition, biliary cirrhosis has been dropped.

Table 5.3

Number of Deaths Attributable to Alcohol Abuse, 1992

Cause	ICD-9 Code	Percent Attributed This Study	Percent Attributed Rice et al. (1990)	Estimate This Study, 1992 Data	Estimate Rice et al. (1990), 1985 Data
DIRECT PRIMARY CAUSES					
Alcoholic psychoses	291.0	100	100	384	368
Alcohol dependence syndrome	303.0	100	100	5,217	4,188
Nondependent abuse of alcohol	305.0	100	100	788	750
Alcoholic polyneuropathy	357.5	100	100	4	2
Alcoholic cardiomyopathy	425.5	100	100	878	767
Alcoholic gastritis	535.3	100	100	90	61
Alcoholic cirrhosis	571.0–571.3	100	100	11,868	11,288
Excessive blood level of alcohol	790.3	100	100	34	12
Accidental poisoning—alcohol	E860.0–E860.1	100	100	179	175
Subtotal				**19,442**	**17,611**
DIRECT SECONDARY CAUSES					
Respiratory tuberculosis	011–012	25	25	329	342
Malignant neoplasm of lip, cavity, and pharynx	140–149	50 (men) 40 (women)	47	3,741	3,896
Malignant neoplasm—esophagus	150	75	75	7,665	6,460
Malignant neoplasm—stomach	151	20	20	2,700	2,790
Malignant neoplasm of liver and interhepatic bile ducts	155	15	15	1,411	1,021
Malignant neoplasm of larynx	161	50 (men) 40 (women)	49	1,894	1,716
Diabetes mellitus	250	5	5	2,423	1,848
Essential hypertension	401	8	0	416	0
Cerebrovascular disease	430–438	7	0	9,985	0
Pneumonia and influenza	480–487	5	5	3,693	3,378
Diseases of esophagus, stomach, and duodenum	530–537 (not 535.3)	10	10	892	943
Chronic hepatitis	571.4	50	0	349	0
Cirrhosis of liver w/out alcohol	571.5[1]	50	50	5,654	6,667
Biliary cirrhosis	571.6	0	50	0	(w/571.5)
Other chronic nonalcoholic liver damage	571.8	50	0	199	0
Unspec. chronic liver disease without mention of alcohol	571.9	50	0	118	0
Portal hypertension	572.3	50	0	67	0
Acute pancreatitis	577.0	42	41	907	917
Chronic pancreatitis	577.1	60	67	126	159
Subtotal				**42,569**	**30,137**

Table 5.3 (Cont'd.)

Number of Deaths Attributable to Alcohol Abuse, 1992

Cause	ICD-9 Code	Percent Attributed This Study	Percent Attributed Rice et al. (1990)	Estimate This Study, 1992 Data	Estimate Rice et al. (1990), 1985 Data
INJURIES AND ADVERSE EFFECTS INDIRECTLY ATTRIBUTED TO ALCOHOL					
Motor vehicle accidents	E810–E825	42	51	17,196	23,190
Pedal cycle, other road accidents	E826, E829[2]	20	20	45	76
Water transport accidents	E830–E838	20	35	167	388
Air and space transport accidents	E840–E845	16	10	175	143
Accidental falls	E880–E888	35	41	4,372	4,919
Accidents caused by fire/flames	E890–E899	45	42	1,831	2,067
Accidental drowning, submersion	E910	38	30	1,339	1,851
Suicide and self-inflicted injury	E950–E959	28	13	8,476	3,828
Homicide and injury purposely inflicted by other persons (Rice et al. [1990]: 960–8)	E960–E969	46	42	11,609	8,329
Other injuries and adverse effects (Rice et al. [1990] used different coding)	E901, E911 E917, E918 E919, E920 E922, E980	25	11	139	2,229
Subtotal				**45,349**	**47,020**
TOTAL				**107,360**	**94,768**

SOURCES: Analysis by The Lewin Group based on data from the National Institute on Alcohol Abuse and Alcoholism (1993), Stinson et al. (1993), National Center for Health Statistics (1996b), and Rice et al. (1990).

NOTE: Components may not sum to totals because of rounding.

[1] Rice et al. (1990) included 571.6 in this category.

[2] Rice et al. (1990) included E825 in this category.

This study uses specified age breaks (e.g., age 15 and older) for 15 of the disease categories that were used by Rice et al. (1990) without age restrictions. This approach was adopted in accordance with current understanding of disease etiology (Stinson et al. 1993). Despite these restrictions, the number of deaths attributed to those categories for which there were age restrictions and for which there were no other methodological changes was slightly higher for this study than for the Rice et al. (1990) study.

Finally, there were 11 diagnostic codes for which the previous nonzero AF was reduced (e.g., automotive crashes and falls) or was increased (e.g., suicide, homicide, drowning, and fires). The net impact of such attribution changes applied to 1992 mortality in the indicated age groups is to increase attributed deaths for these 11 diagnoses from about 44,800 (using factors applied by Rice et al.) to 46,300 (using factors in this study).

5.2.2.2 Deaths Attributable to Drug Abuse

A similar process to that used for alcohol-attributable deaths was followed for identifying deaths attributable to drug abuse. The Rice et al. (1990) study (and previously Cruze et al. [1981]) employed a list of drug abuse-related causes (diagnostic codes) originally designated by the National Institute on Drug Abuse for use by the Drug Abuse Warning Network (Gottshalk et al. 1977, 1979). This list includes diagnoses representing abuse of and dependence on psychoactive drugs as well as accidental and intentional (i.e., suicide) poisoning by a broad range of drugs and medicaments—psychoactive and otherwise.

The rationale for using the broad list of drug types had its origin in the difficulty of determining the motivation for drug ingestion. Inappropriate use of prescription or nonprescription drugs constitutes drug abuse, whether a person takes a prescription medication without a prescription or takes a drug for an objective other than that for which it is appropriate.

This study has augmented the basic list of codes by incorporating estimates of deaths from several health problems associated with drug abuse and dependence. Chapter 4 presents the reviews and analyses performed to obtain estimates of attribution factors for tuberculosis, hepatitis B and C, and AIDS for health expenditures. The primary data and references used to calculate the attributable deaths for each of these additional diagnoses are briefly reviewed below. Table 5.4 summarizes data on the number of deaths attributed in this study to drug abuse.

5.2.2.2.1 AIDS

In 1992, 33,566 persons died of AIDS (NCHS 1996b). These data are obtained through the national death certificate data. Attribution of AIDS deaths was based on mortality data from national case reports for 1991 submitted to the Centers for Disease Control and Prevention (CDC) surveillance system. This source was chosen because the mortality data provide comprehensive information about AIDS exposure (CDC unpublished data, November 1994). The estimate of 33,566 AIDS deaths incorporates a downward adjustment for the fact that among deaths of AIDS patients, 88 percent were due to AIDS or AIDS-related causes, and the other 12 percent were unrelated (e.g., trauma) (Chu et al. 1993). The most recent year with complete data at the time that these calculations were developed was 1991.

This analysis applied to the reported 33,566 deaths the proportion of deaths within the following exposure categories from the CDC mortality data set (these values were adjusted upward to account for the 5 percent of deaths with no identified exposure category):

- Adults/adolescents who are injecting drug users (about 24 percent of deaths with identified exposure category);
- Adults/adolescents who have heterosexual sex with injecting drug users (about two-thirds of the 6 percent exposed through heterosexual contact);

Table 5.4

Number of Deaths Attributable to Drug Abuse, 1992

Cause	ICD-9 Code	Estimate This Study, 1992 Data	Estimate Rice et al. (1990), 1985 Data
Drug psychoses	292	13	11
Drug dependence	304	309	1,165
Nondependent abuse of drugs	305.2–305.9	777	524
Polyneuropathy due to drugs	357.0	0	0
Newborn affected by maternal transmission of narcotics and hallucinogens via placenta or breast milk	760.72, 760.73	NA	0
Drug withdrawal syndrome in newborn	779.5	6	1
Accidental poisoning by drugs, medicaments, and biologicals	E850–858 (Rice et al. [1990] includes 859)	5,951	3,552
Agricultural and horticultural chemical and pharmaceutical preparations other than plant foods and fertilizers	E863	18	0
Heroin, methadone, other opiates and related narcotics, and other drugs causing adverse effects in therapeutic use	E935.0–E935.2, E937–E940	27	33
Injury undetermined whether accidentally or purposely inflicted from poisoning by drugs, medicaments, and other	E980	1,464	832
Homicide and injury purposely inflicted by other persons (age ≥ 15)	E960–E969	2,514	0
Tuberculosis	010–018	77	0
Hepatitis C	various	900	0
Hepatitis B	various	2,700	0
AIDS	various	10,737	1,336
TOTAL		**25,493**	**7,454**

SOURCES: Attribution factors: Gottshalk et al. (1977); analysis by The Lewin Group.

NOTE: The 760.7 diagnosis contains several factors in addition to narcotic and hallucinogen drugs. There were 69 deaths under this diagnosis in 1992, but the five-digit cause of death values were not available. Number of deaths derived from the National Center for Health Statistics (1996b) (mortality by cause for 1992).

- Adult/adolescent men who have sex with men and inject drugs (one-half of the 6 percent with dual exposure); and
- Children (under age 13) with a mother who has an infection or is at risk for infection because she is an injecting drug user or has sex with an injecting drug user (more than one-half of the 1 percent who were pediatric AIDS cases).[1]

Out of the 33,566 AIDS deaths in 1992, this study attributes 10,737, or about 32 percent, to intravenous drug abuse. This rate is slightly below the 36-percent AF used for health care expenditures. The difference in these values lies in that the proportion of injecting-drug-user HIV cases has steadily increased since the beginning of the epidemic. The proportion of deaths (this section) actually represents AIDS cases reported several years previously.

5.2.2.2.2 Hepatitis B and C

The ICD-9 death certificate data undercount the number of deaths due to hepatitis B and C because they do not make the link between hepatitis and chronic liver disease. As an alternative to the ICD-9 data, the CDC Hepatitis Branch has developed annual death estimates, which take into account the toll of chronic liver disease brought on by hepatitis B and C (CDC 1993c, personal communication). The Branch estimates that there are 4,000 to 5,000 deaths a year from hepatitis B and 8,000 to 10,000 from hepatitis C. For the purposes of this analysis, the midpoint of these CDC-produced ranges is used to estimate that there were 4,500 deaths annually from hepatitis B and 9,000 annually from hepatitis C.

To estimate the numbers of these deaths attributable to intravenous drug use, this study relies on a sentinel risk factor study conducted by the CDC in four representative U.S. counties (Alter et al. 1990a). These studies reported the risk factors for acquiring hepatitis B and C, including parenteral (intravenous) drug use as a factor. Although these data do not link case development to death reports, it is thought that these are the most complete data presently available to estimate the number of hepatitis deaths associated with drug use. This study reported that 20 percent of the hepatitis C cases and 30 percent of the hepatitis B cases were linked to drug use for the range of years studied. This analysis uses these percentages as AF's to calculate the number of deaths attributable to drug use.

5.2.2.2.3 Tuberculosis

As described in chapter 4 of this report, it is estimated that drug abuse contributes to 4.5 percent of the tuberculosis cases that occur each year. This figure is applied to the deaths identified through the public-use data set from ICD-9 codes for tuberculosis (010 to 018). Co-infection with HIV does not lead to double counting of dually exposed individuals because both the death certificate ICD-9 system and the AIDS surveillance data from the CDC that this study uses impose a hierarchy of classification that assigns dually infected individuals to HIV/AIDS instead of tuberculosis.

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[1] Data obtained from Mr. Xenophon Santis, Statistics and Data Management Branch, Division of HIV/AIDS, Centers for Disease Control and Prevention, November 28, 1994.

5.2.3 Mortality Costs

The death of a person represents a loss of productive potential, whether in the marketplace (employment) or in the household. This productive potential has a clear economic value. For example, many families buy life insurance to protect against the potential loss of future productive contributions by those contributing to the upkeep of the household through jobs, homemaking responsibilities, or both. In instances of wrongful death, court cases make awards to family members of decedents based at least partially on their expected future earnings as well as the cost of replacing their expected contributions to maintaining the household. The "value of life" is recognized to be more than the replacement of future productive contributions. There are two major methods generally used to estimate the costs of premature mortality: the human capital and the willingness-to-pay approaches, both of which were briefly discussed in chapter 3.

This study applies the human capital approach to the estimation of mortality costs. This is the approach that has been used in most previous cost-of-illness studies (Hodgson and Meiners 1982). The approach to estimation of the cost for an individual is to sum the present discounted value of estimated productivity (market as well as nonmarket) over the person's expected remaining lifetime. Using this approach, a dollar value is assigned to production lost because of premature death.

The table of expected lifetime productivity (market plus nonmarket/household) by age and sex for 1992 was obtained in a personal communication from Dorothy Rice (1997). The formula for these calculations appears in Rice et al. (1990). Because Rice estimated lifetime productivity values for discount rates of 2, 4, and 6 percent, but not 3 percent, this value was interpolated from the values for 2 percent and 4 percent, which were provided by Rice. Analysis of the tables provided by Rice indicated that the interpolation should use the geometric mean, which actually provides a lower estimate of the value than use of the arithmetic mean or "average" provides. These estimates appear in appendix B of this report. Recent research suggests that a 3-percent discount value (as well as other, higher values) should be used in performing cost-benefit studies of health services (Gold et al. 1996).

The calculation of "present discounted value of expected lifetime earnings" for a person of a given age and gender begins with Bureau of Census "life tables." These tables provide average expected additional years of life (which depends on gender and current age) and use data on the average expected value of market (wages plus the value of fringe benefits) plus nonmarket productivity by age and gender. Expected productivity values are generally assumed to grow by 1 percent annually, reflecting expected growth in real labor productivity over time. Summing these values across the expected lifetime yields total expected lifetime productivity. For economic purposes, values in future years are adjusted down (discounted) by an amount related to the number of years in the future and the selected discount rate (equivalent to an interest rate). This adjustment reflects that a dollar today is worth more next year because it can accrue interest in the interim. Accordingly, a future value is reduced when considered in present discounted value terms. The higher the discount rate and the further in the future, the lower the present discounted value of future productivity.

Discussion is warranted on at least two particular issues in application of human capital estimates to alcohol and drug abusers: the discount rate and the expected future course of productivity. It is possible that a person with an alcohol or drug abuse problem may have lower productivity than a member of the general population—indeed, this is examined and supported in the next section of this report. The question is whether such a factor would justify using values lower than those for the general population in estimating future productivity. The rationale for not making such an adjustment or reduction is that if alcohol or drug abuse has caused the initial/current deficit relative to expected productivity, then future deficits will probably also be caused by those problems. Although it is likely that alcohol and drug abusers would have had lower future productivity, this would be caused by and attributable to alcohol and drug abuse, and making the adjustment would omit a material effect and cost that should be counted.

The appropriate discount rate for human capital estimates is somewhat controversial (Burkhead and Miner 1971). A high discount rate gives a lower present value of expected earnings, and a low discount rate gives a higher present value of expected earnings. There is extensive debate about what rate is appropriate for what kinds of studies. Higher rates (such as 8 to 10 percent) are used when there is more risk or uncertainty associated with a stream of values, while lower discount rates (2 to 4 percent) are used when there is less risk or uncertainty around events. Higher rates give preference to current benefits and consumption, whereas lower discount rates give more emphasis to future consumption and benefits. The major prior alcohol and drug studies have used a value in between—6 percent—and the primary justification for using this value is to allow comparability with previous estimates. However, lower values, such as 3 percent, are apparently being used in much cost-benefit work for the Office of Management and Budget. This study reports costs using rates of 3, 4, and 6 percent. The more conservative, 6-percent figure (in that it gives lower cost estimates) is used in constructing and reporting the total estimates.

Using a 6-percent discount rate, the costs of alcohol and drug abuse-related deaths in 1992 are estimated to be $45.2 billion. About $30.7 billion of this is attributed to alcohol abuse (see table 5.5), and $14.6 billion is attributed to drug abuse (see table 5.6), or about $290,000 per alcohol-related death and $570,000 per drug-related death. The value per drug death is much higher because much of the alcohol-related mortality occurs at older ages as a result of chronic effects (cirrhosis and neoplasms), whereas virtually all the drug deaths are among young and prime-age adults (drug overdoses, homicide, and AIDS). Estimates are also calculated and reported using 3-percent and 4-percent discount rates. At a 3-percent discount rate, the estimated costs are $45.7 and $21.3 billion, respectively, or $425,000 and $835,000 per death for alcohol and drug abuse.

Much higher costs would result from application of the willingness-to-pay approach. A review of the willingness-to-pay literature found an average value per death across 47 studies of $2.3 million in 1989 dollars (cited in Miller et al. 1995). Adjusted for 3 years of inflation (about 12 percent to $2.55 million per death), this approach would indicate losses of $274 billion for alcohol-related mortality and $65 billion for drug-related deaths. These values are almost 9 and 4.5 times greater, respectively, than the estimates obtained using the human capital approach with a 6-percent discount rate. The application of the willingness-to-pay technique should be given further consideration. It was found that for smoking behaviors, willingness-to-pay values were substantially lower than for other populations and risks. It is worth considering whether the willingness-to-pay to save the lives of alcohol and drug abusers would be different from values for other types of risk and how such values would compare with other willingness-to-pay values.

5.3 The Impact of Alcohol and Drug Abuse Morbidity on Productivity

5.3.1 Synopsis

Alcohol and drug abuse can interfere with an individual's employment and productivity. Both drug and alcohol abuse may interfere with a person's ability to work (physical and/or mental impairment); ability to find a job (lack of skills or lack of experience); and, potentially, willingness to find a job. Wages among workers with alcohol or drug abuse problems may be lower than among similar workers without such problems. Shortfalls in productivity and employment among individuals with alcohol or drug abuse disorders accounted for estimated losses of $80.9 billion in lost productivity. Of this, it is estimated that $66.7 billion resulted from alcohol problems and $14.2 billion resulted from drug problems. These estimates were arrived at through analysis of data from the National Longitudinal Alcohol Epidemiologic Survey (NLAES; Grant et al. 1994) using the microsimulation techniques that have been used in studies of the RAND Health Insurance Experiment (e.g., Newhouse and the Health Insurance Group 1993; Manning et al. 1987; Duan 1983). The analyses reported below examine the employment and productivity effects of alcohol and drug abuse disorders.

5.3.2 Introduction

Chronic and severe alcohol and drug abusers are often thought to have great difficulties obtaining and keeping stable employment. This is seen in populations that enroll with publicly funded treatment providers. In the most severe cases, alcohol and drug abusers may be institutionalized, homeless, and/or spending much of their time committing crimes to generate the income necessary to maintain a drug habit. Drug or alcohol abusers may be frequently intoxicated or high and unable to work if they had a job. Many severe alcohol and drug abusers have never held a full-time job for any significant period of time. It is common for alcohol and drug abusers to move from one part-time job to another. Moreover, it is believed that many more alcohol and drug abusers are either temporarily out of work because of their alcohol or drug use (they have been fired or quit) or that they are "underemployed" in part because of their alcohol- or drug-abusing lifestyle.

Table 5.5

Economic Cost of Mortalities Due to Alcohol Abuse, for Various Discount Rates, 1992

Causes of Death, by ICD-9 Code		Total Deaths	Attributed to Alcohol Abuse			Discounted Economic Effects (millions of dollars)		
Cause	ICD-9 Code		Percent	Age	Number	3%	4%	6%
DIRECT PRIMARY CAUSES								
Alcoholic psychoses	291	384	100	> 0	384	113.9	103.8	88.3
Alcohol dependence syndrome	303	5,217	100	> 0	5,217	2,215.9	2,012.3	1,701.1
Nondependent abuse of alcohol	305.0	788	100	> 0	788	504.4	445.8	360.7
Alcoholic polyneuropathy	357.5	4	100	> 0	4	1.0	1.0	0.9
Alcoholic cardiomyopathy	425.5	878	100	> 0	878	329.0	299.7	254.7
Alcoholic gastritis	535.3	90	100	> 0	90	42.1	38.0	31.9
Alcoholic cirrhosis	571.0–571.3	11,868	100	> 0	11,868	4,664.2	4,246.7	3,604.9
Excessive blood level of alcohol	790.3	34	100	> 0	34	31.2	27.0	21.2
Accidental poisoning by alcohol	E860.0, E860.1	179	100	> 0	179	128.1	113.0	91.1
DIRECT SECONDARY CAUSES								
Tuberculosis	011–012	1,315	25	≥ 35	329	905.8	811.0	670.1
Malignant neoplasm of lip, oral cavity, and pharynx	140–149	8,107	50 (men) 40 (women)	≥ 35	3,741	632.6	589.1	519.1
Malignant neoplasm of esophagus	150	10,239	75	≥ 35	7,665	1,073.3	1,005.0	893.8
Malignant neoplasm of stomach	151	13,630	20	≥ 35	2,700	316.6	294.6	259.3
Malignant neoplasm of liver and interhepatic bile ducts	155	9,555	15	≥ 35	1,411	178.8	166.4	146.5
Malignant neoplasm of larynx	161	3,114	50 (men) 40 (women)	≥ 35	1,894	284.8	266.5	236.7
Diabetes mellitus	250	50,067	5	≥ 35	2,423	255.3	237.3	208.6
Essential hypertension	401	5,232	8	≥ 35	416	33.7	31.5	27.8
Cerebrovascular disease	430–438	143,769	7	≥ 35	9,985	586.3	546.4	482.5

Table 5.5 (Cont'd.)

Economic Cost of Mortalities Due to Alcohol Abuse for Various Discount Rates, 1992

Causes of Death, by ICD-9 Code		Total Deaths	Attributed to Alcohol Abuse			Discounted Economic Effects (millions of dollars)		
Cause	ICD-9 Code		Percent	Age	Number	3%	4%	6%
DIRECT SECONDARY CAUSES (Cont'd)								
Pneumonia and influenza	480–487	75,719	5	≥ 35	3,693	181.8	168.9	148.5
Diseases of esophagus, stomach, and duodenum	530–537 (excl. 535.3)	9,088	10	≥ 35	892	67.6	62.8	55.2
Chronic hepatitis	571.4	729	50	≥ 35	349	65.9	60.8	52.6
Cirrhosis of liver without mention of alcohol	571.5	11,506	50	≥ 35	5,654	1,145.2	1,058.0	920.0
Other chronic nonalcoholic liver damage	571.8	482	50	≥ 35	199	94.8	86.2	73.0
Unspecified chronic liver disease without mention of alcohol	571.9	244	50	≥ 35	118	23.4	21.5	18.6
Portal hypertension	572.3	144	50	≥ 35	67	12.0	11.2	9.9
Acute pancreatitis	577.0	2,317	42	≥ 35	907	170.5	156.6	134.8
Chronic pancreatitis	577.1	222	60	≥ 35	126	33.9	31.0	26.6
INJURIES AND ADVERSE EFFECTS INDIRECTLY ATTRIBUTABLE TO ALCOHOL								
Motor vehicle traffic and nontraffic accidents	E810–E825	40,982	42	> 0	17,196	12,685.1	10,692.3	8,023.1
Pedal cycle and other road vehicle accidents	E826, E829	223	20	> 0	45	28.6	24.1	18.2
Water transport accidents	E830–E838	837	20	> 0	167	133.1	113.9	87.6
Air and space transport accidents	E840–E845	1,094	16	> 0	175	129.9	113.6	90.3
Accidental falls	E880–E888	12,646	35	≥ 15	4,372	664.8	591.6	485.1
Accidents caused by fires and flames	E890–E899	3,958	45	> 0	1,831	994.5	806.1	572.4
Accidental drowning and submersion	E910	3,524	38	> 0	1,339	1,068.2	869.0	617.1

Table 5.5 (Cont'd.)

Economic Cost of Mortalities Due to Alcohol Abuse, for Various Discount Rates, 1992

Causes of Death, by ICD-9 Code		Total Deaths	Attributed to Alcohol Abuse			Discounted Economic Effects (million of dollars)		
Cause	**ICD-9 Code**		**Percent**	**Age**	**Number**	**3%**	**4%**	**6%**
INJURIES AND ADVERSE EFFECTS INDIRECTLY ATTRIBUTABLE TO ALCOHOL (Cont'd)								
Suicide and self-inflicted injury	E950–E959	30,484	28	≥ 15	8,476	5,533.4	4,801.1	3,771.6
Homicide and injury purposely inflicted by other persons	E960–E969	25,144	46	≥ 15	11,609	10,342.2	8,746.8	6,589.3
Other injuries and adverse effects	E901, E911, E917, E918, E919, E920, E922, E980	558	25	≥ 15	139	45.8	40.8	33.5
TOTAL		**483,490**			**07,360**	**45,717.7**	**39,691.5**	**31,326.6**

SOURCES: Alcohol attributable factors: National Institute on Alcohol Abuse and Alcoholism (1993) and Stinson et al. (1993); number of deaths: National Center for Health Statistics (1996b); NCHS Public Use ICD-9 Data Tape (age and gender distribution for deaths by ICD code for 1991); economic costs: Rice (1997), personal communication. Present discounted values for the 3-percent discount rate were estimated by interpolation of values for 2- and 4-percent discount rates.

NOTE: Components may not sum to totals because of rounding.

Table 5.6

Economic Cost of Mortalities Due to Drug Abuse, for Various Discount Rates, 1992

Cause of Death, by ICD-9 Code			Attributable to Drug Abuse		Discounted Economic Impact (millions of dollars)		
Cause	ICD-9 Code	Total Deaths	Percent	Number	3%	4%	6%
DIRECT PRIMARY CAUSES							
Drug psychoses	292	13	100	13	6.7	5.9	4.7
Drug dependence	304	309	100	309	255.1	224.8	180.8
Nondependent abuse of drugs	305.2–305.9	777	100	777	618.8	544.6	437.1
Drug withdrawal syndrome in newborn	779.5	6	100	6	4.3	2.9	1.5
Accidental overdose of psychoactive drugs							
Opiates and related narcotics	E850.0	1,279	100	1,279	1,130.9	992.5	792.4
Aromatic analgesics, not elsewhere classified	E850.2	69	100	69	36.7	32.2	25.9
Other non-narcotic analgesics	E850.7	0	100	0	0.0	0.0	0.0
Other	E850.8	167	100	167	151.7	132.6	105.2
Unspecified analgesics and antipyretics	E850.9	2	100	2	1.9	1.7	1.4
Barbiturates	E851	21	100	21	13.3	11.6	9.3
Other sedatives and hypnotics	E852	11	100	11	7.6	6.6	5.3
Tranquilizers	E853	65	100	65	39.6	34.9	28.1
Other psychotropic agents (incl. antidepressants)	E854	269	100	269	197.7	171.4	134.6
Other drugs acting on the central and autonomic nervous system	E855	1,113	100	1,113	1,009.4	877.3	689.6
Agricultural and horticultural chemical and pharmaceutical preparations other than plant foods and fertilizers	E863	18	100	18	9.9	8.4	6.3
Accidental Overdose of Drugs and Medicaments							
Salicylates	E850.1	56	100	56	23.5	20.5	16.3
Pyrazole derivatives	E850.3	2	100	1	0.9	0.9	0.8
Antirheumatics	E850.4	3	100	2	1.8	1.5	1.2

Table 5.6 (Cont'd.)

Economic Cost of Mortalities Due to Drug Abuse, for Various Discount Rates, 1992

Cause of Death, by ICD-9 Code	ICD-9 Code	Total Deaths	Attributable to Drug Abuse		Discounted Economic Effects (millions of dollars)		
Cause			Percent	Number	3%	4%	6%
DIRECT PRIMARY CAUSES (Cont'd)							
Other non-narcotic analgesics	E850.5	79	100	79	60.8	53.5	42.9
Accidental poisoning by antibiotics	E856	55	100	55	15.3	13.3	10.6
Accidental poisoning by other anti-infectives	E857	5	100	5	3.1	2.7	2.2
Hormones and synthetic substitutes	E858.0	18	100	18	5.7	5.1	4.2
Primarily systemic agents	E858.1	44	100	44	21.3	18.2	14.0
Agents primarily affecting blood constituents	E858.2	33	100	33	13.0	9.9	6.4
Agents primarily affecting cardiovascular system	E858.3	218	100	218	16.8	14.9	12.2
Agents primarily affecting gastrointestinal system	E858.4	3	100	3	1.0	0.9	0.8
Water mineral and uric acid metabolism drugs	E858.5	75	100	75	13.6	11.8	9.4
Agents primarily acting on the smooth and skeletal muscles and respiratory system	E858.6	8	100	8	3.7	3.1	2.4
Agents primarily affecting skin and mucous membrane, ophthalmological, otorhinolaryngological, dental drugs	E858.7	7	100	7	1.0	1.0	0.9
Other specified drugs	E858.8	1,328	100	1,328	1,133.0	993.6	792.5
Unspecified drug	E858.9	1,021	100	1,021	855.1	749.6	597.3
Heroin, methadone, other opiates and related narcotics, and other drugs causing adverse effects in therapeutic use	E935.0– E935.2 E937–E940	27	100	27	5.4	4.8	3.9
INJURY UNDETERMINED WHETHER ACCIDENTAL OR PURPOSELY INFLICTED							
Analgesics, antipyretics, and antirheumatics	E980.0	491	100	491	404.7	355.0	283.4
Barbiturates	E980.1	13	100	13	9.3	8.1	6.5
Other sedatives and hypnotics	E980.2	8	100	8	6.0	5.3	4.2
Tranquilizers and other psychotropic agents	E980.3	159	100	159	109.9	96.5	77.3

Table 5.6 (Cont'd.)

Economic Cost of Mortalities Due to Drug Abuse, for Various Discount Rates, 1992

Cause of Death, by ICD-9 Code		Total Deaths	Attributable to Drug Abuse		Discounted Economic Effects (millions of dollars)		
Cause	ICD-9 Code		Percent	Number	3%	4%	6%
INJURY UNDETERMINED WHETHER ACCIDENTAL OR PURPOSELY INFLICTED (Cont'd)							
Other specified drugs and medicinal substances	E980.4	478	100	478	405.1	352.9	278.6
Unspecified drug or medicinal substance	E980.5	252	100	252	201.0	176.6	141.3
Other and unspecified solid and liquid substances	E980.9	63	100	63	45.1	39.4	31.3
Homicide and injury purposely inflicted by other persons	E960–E969	25,144	10	2,514	2,239.2	1,893.7	1,426.6
OTHER CAUSES							
Tuberculosis	010–018	1,705	4.5	77	21.2	19.0	15.7
Hepatitis C	See discussion	4,500	20	900	819.4	698.2	532.0
Hepatitis B	See discussion	9,000	30	2,700	2,438.3	2,077.9	1,583.9
AIDS	See discussion	33,566	32	10,737	8,958.2	7,849.1	6,254.3
TOTAL				**25,493**	**21,316.3**	**18,524.6**	**14,574.9**

SOURCES: Attribution factors: Gottshalk et al. (1977); analysis by The Lewin Group, Chu et al (1993), Alter et al. (1990a); number of deaths: National Center for Health Statistics (1996b); NCHS Public Use ICD-9 Data Tape (age and gender distribution for deaths by ICD code for 1991); economic costs: Rice (1997), personal communication. Present discounted values for 3 percent were estimated based on values for 2 percent and 4 percent, respectively.

NOTES: Components may not sum to totals because of rounding.

Although the negative relationship between the presence and severity of an alcohol and/or drug abuse problem and an individual's labor supply and wage rate may seem logical, empirical evidence has been mixed, particularly in the case of drug abuse and dependence. Analysis of the relationship between alcohol or drug abuse and productivity is complicated by a variety of measurement and conceptual issues. These issues include the following:

- How to measure alcohol and drug abuse (consumption versus clinical measures);
- How to model the several potential interrelationships of income and alcohol or drug use or problems (e.g., as income increases, consumption may increase if drugs and alcohol are normal goods; and disability from alcohol or drug abuse or dependence may impair ability to work);
- How to measure lagged or cumulative effects over time;
- The extent to which individuals with alcohol or drug abuse disorders are underrepresented in general populations that are studied through surveys; and
- The role of co-occurring mental disorders, which can often be found among individuals with alcohol or drug disorders.

Viewing the reductions in productivity associated with alcohol and drug abuse as a cost to society is somewhat controversial. Some economists see the decision to consume or even to abuse alcohol or drugs as a rational, utility-maximizing choice. If an individual chooses to consume drugs or alcohol, even though such consumption reduces productivity, the loss is strictly to the individual and is at least offset by the perceived benefits the individual obtains. Following this line of logic, no costs are incurred by society because the drinker or drug user experiences all of the effects. The effects are said to be "internal" to the user, in contrast to effects that might "spill over" to those around the user through drinking and driving, alcohol- or drug-related crime, or poor performance (below expectations for the given wage) on the job. These are usually termed "external costs" and are widely regarded by economists as the only costs germane to decisions about taxation designed to correct for "spillover" effects that are associated with problem alcohol consumption.

However, the position taken in this report (and in essentially all prior major alcohol and drug abuse cost-of-illness studies) is to estimate all such costs, both internal and external. There are several reasons to justify this approach. First, such costs are often transferred to family members and the rest of society and thus are not completely internal (see chapters 3 and 7 of this report). Second, in a more theoretical line, it can be argued that the choices made by drug and alcohol abusers are made under uncertainty with incomplete information. Abuse or addiction, and the associated negative consequences, are not desired outcomes, but rather are usually unintended outcomes resulting from inaccurate perceptions regarding the risks associated with alcohol and drug consumption. As such, the reduced productivity resulting from abuse or addiction may be viewed as costs to society and not solely as elements of a private decision calculus. Finally, documenting the costs that are borne by individuals with alcohol and drug abuse disorders may help support more informed individual decisionmaking about behaviors that could lead to the development of such disorders.

Estimates reported in this study are based on analysis of a recent national survey that has many strong attributes recommending it for this purpose: the NLAES. The NLAES data set allows analysts to categorize individuals based on the presence of alcohol and drug use disorders as well as major depression (one of the most prevalent mental disorders and the one most closely associated with alcohol use disorders). Those with multiple conditions can be distinguished from those with an alcohol, drug, or mental disorder diagnosis only. This categorization allows analysts to explore the impact of alcohol and drug abuse and comorbidity on productivity using two important labor market outcomes: employment and personal earnings.

The next section reviews previous studies on the impact of alcohol and drug abuse on labor market outcomes and briefly discusses the issue of comorbidity of alcohol or drug abuse and mental disorders. Following this literature review is a description of the NLAES data and the construction of study samples, estimates of the impact of alcohol and drug abuse on employment and personal income from the data set, and application of these estimates to compute the productivity losses associated with alcohol and drug abuse.

5.3.3 Previous Studies

A number of studies have analyzed the impact of drug and alcohol abuse on various aspects of work and productivity, including education, labor force participation, earnings or income, occupation, and job mobility. Findings of the most recent studies are summarized in table 5.7.

In general, studies of the impact of alcohol abuse or dependence on wages or income have found significant negative effects ranging from about 1 to 30 percent. Most of these studies use data from the Epidemiologic Catchment Area (ECA) survey. The ECA data allow categorization of individuals on the basis of a clinical definition of alcohol abuse or dependence, as opposed to a definition based simply on alcohol consumption patterns. The studies in table 5.7 that categorized individuals based on alcohol consumption found either positive or no effect of alcohol consumption on wages or income: People who consume alcohol did not have lower average income, but rather higher income. Studies using the ECA data have also found that a lifetime diagnosis of alcohol abuse or dependence (i.e., a diagnosis of alcohol abuse or dependence at any time in one's life) is associated with a reduced likelihood of working full-time and that symptoms of alcohol abuse occurring before age 18 are associated with a 1.5-year reduction in educational attainment.

Recent studies of the impact of drug use and abuse on wages or income are more numerous than those that analyze the impacts of alcohol abuse. The majority of these studies use data from various years of the National Longitudinal Survey of Youth (NLSY). These data allow for the categorization of individuals based on drug use (type of drugs used and the level of use), rather than on the basis of diagnostic criteria, and focus on individuals of ages 18 to 30. The findings from studies using the NLSY generally indicate that drug use is associated with a *positive* deviation in wages. Explanations given for this finding include the existence of unobserved characteristics that affect the observed relationship between drug use and wages (e.g., that individuals who use drugs, for unobserved reasons, are more productive than average), and the idea that drugs are a normal good, and because wages are a primary component of income, the relationship observed is simply an income effect (i.e., reverse causality). Several studies have attempted to address these issues with sophisticated econometric modeling (Kaestner 1991, 1994b); Register and Williams 1992; Gill and Michaels 1992) or by using longitudinal data to estimate models of drug use and wages that can control for individual characteristics over time. These studies still find positive or insignificant effects of drug use on wages.

Studies of the relationship between drug abuse and income using the ECA data have found the effects to be negative, but insignificant for males and positive for females. One study, however, estimates the effects separately for males ages 18 to 29 and males ages 30 to 45, finding a significant and negative effect of drug abuse or dependence on personal income for males in the 30-to-45 age group. These studies differ from those using the NLSY because they use a measure of drug abuse or dependence, as opposed to “any” drug use, and they include persons over age 30 in their samples.

The effects of drug use on labor force participation have been addressed by two recent studies, one using the diagnostic data available from the ECA and the other using the drug use data from the NLSY. These studies find significant negative effects of drug use or abuse on employment or labor supply for males (Kaestner 1994a; Buchmueller and Zuvekas 1994) but insignificant or positive effects for females (Kaestner 1994a).

The co-occurrence of alcohol or drug abuse and mental disorders has been shown to be quite common. Regier et al. (1990), using data from the ECA on persons both in institutions and in the community, estimate the lifetime prevalence of mental disorders to be 37 percent among persons with an alcohol disorder and 53 percent among persons with a drug disorder. None of the studies of the impact of drugs and alcohol on wages listed in table 5.7, however, have attempted to disentangle the effects of mental illness and alcohol or drug abuse among individuals with diagnoses of both conditions. Because mental disorders have large negative effects on wages and income (Bartel and Taubman 1979; Rice et al. 1990) and because the comorbidity of mental illness and alcohol or drug abuse is common, the true impact of alcohol and drug abuse on income may be either larger or smaller than estimated, depending on whether or not an indicator for mental illness is included in the specification. Of the studies described in table 5.7, those using data from the ECA typically have included indicators for the presence of mental disorders, whereas those using the NLSY have not.

It is important to incorporate psychiatric comorbidity in estimates of the impact of alcohol and drug abuse on reduced productivity. The discussion of psychiatric comorbidity in chapter 4 of this report suggests that assigning causality to alcohol and drug abuse or mental illness among persons with both types of problems is very complicated. This analysis has employed regression analysis in order to estimate the independent contributions of alcohol, drug, and depression disorders on earnings and employment.

Table 5.7

Studies of the Impact of Alcohol and Drug Abuse on Productivity

Study	Data and Sample	Principal Findings
		ALCOHOL STUDIES
Berger and Leigh 1988	Quality of Employment Survey (1972–73), males and females age 18+	Positive effect of current alcohol consumption on wages. Estimated wages of drinkers exceed those of nondrinkers by 8–57% for men and 26–40% for women.
Heien and Pittman 1989	National alcohol survey (1979)	Problem-drinking status endogenous. No significant effect of alcohol consumption on family income after accounting for this endogeneity.
Mullahy and Sindelar 1989	ECA (New Haven site only), males ages 25 to 59	Symptoms of alcohol abuse at young ages are associated with a 1.5-year reduction in educational attainment. No significant effect of current symptoms on current earnings.
Rice et al. 1990	ECA (multiple sites), males and females ages 18 to 64	Lifetime diagnosis of alcohol abuse is associated with a 1–9% reduction in personal income for males and a 1–19% reduction for females. Magnitude depends on age.
Mullahy and Sindelar 1991a,b	ECA (multiple sites), males and females ages 18 to 64	Lifetime diagnosis of alcohol abuse/dependence is associated with reductions in the likelihood of working full time (7–19%) and personal income (3–23%).
Mullahy and Sindelar 1991a	ECA (New Haven only), males ages 22 to 64 (mainly ages 30 to 59)	Lifetime diagnosis of alcoholism is associated with reductions in the likelihood of working full time and in household income (17–31%). The magnitude of the estimates are sensitive to the model specification.
		DRUG STUDIES
Rice et al. 1990	ECA (multiple sites), males and females ages 18 to 64	Lifetime diagnosis of drug abuse/dependence associated with a 1–9% reduction in personal income for males (not significant) and positively associated with personal income for females (not significant).
Kandel and Davies 1990	NLSY (1984 and 1985), males ages 18 to 27	Use of marijuana is associated with an increase in employment gaps and the number of weeks unemployed. Use of cocaine increases job mobility, gaps, and unemployment. No effect of recent drug use on current wages controlling for previous years' wages.
Kaestner 1991	NLSY (1984) males and females ages 18 to 27	Use of cocaine and/or marijuana has positive effect on the wages of males and females after controlling for selectivity and endogeneity of drug use.
Register and Williams 1992	NLSY (1984), males ages 18 to 27	Predicted use of marijuana or cocaine negatively associated with employment, but long-term and on-the-job use are positively associated. Overall positive effect of marijuana use on wages. No significant effect of cocaine use on wages.
Gill and Michaels 1992	NLSY (1980 and 1984), males and females ages 18 to 27	Use of drugs significantly reduces the probability of employment. No significant effect of "hard" drugs on employment. Drug users have higher wages but lower returns to human capital characteristics than nonusers.

Table 5.7 (Cont'd)

Studies of the Impact of Alcohol and Drug Abuse on Productivity

Study	Data and Sample	Principal Findings
DRUG STUDIES (Cont'd)		
Kaestner 1994b	NLSY (1984 and 1988), males and females ages 23 to 30	Positive effect of drug use on wages in cross-sectional model for males and females. Negative effect of drug use on wages for males (not significant) and positive effect (significant) for females in longitudinal fixed-effects model.
Kaestner 1994a	NLSY (1984 and 1988), males and females ages 21 to 30	Marijuana and cocaine use have negative impact on labor supply in a cross-sectional analysis, particularly among males. Longitudinal analysis indicates no effect of illicit drug use on labor supply for males or females.
Buchmueller and Zuvekas 1994	ECA (multiple sites), males ages 18 to 45	Drug abuse has a significant negative impact on the likelihood of employment and on the income of males ages 30 to 45 but no effect on the employment or income of males ages 18 to 29.
Buchmueller and Zuvekas 1996	ECA (multiple sites), males ages 18 to 45	Drug abuse or dependence has a significant negative impact on income among young and prime-age males. Although moderate drug use is associated with higher income among young males, this disappears among older males.

5.3.4 Data Source

This section provides a description of the primary data source used in this analysis, the construction of study samples, and the key variables used in the analysis. This analysis of the relationship between alcohol and drug disorders and productivity (employment and earnings) has been performed using the 1992 NLAES (Grant et al. 1994). The NLAES is a nationally representative household survey using face-to-face interviews conducted by the U.S. Bureau of the Census for the NIAAA. More than 42,000 people ages 18 and over were interviewed in depth about their attitudes, beliefs, and behaviors with respect to alcoholic beverages and illicit psychoactive drugs. Additional questions examined symptomatology of depression, which is one of the most frequently co-occurring disorders with alcohol and drug abuse.

NLAES data can be analyzed to estimate current and lifetime prevalence of alcohol and illicit drug disorders among adults, based on clinical criteria from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM–IV; American Psychiatric Association 1994). Identification of individuals meeting clinical criteria for alcohol and drug disorders was based on responses to questions about alcohol- and drug-related behaviors, experiences, and related symptomatology that correspond to clinical criteria for diagnosing abuse of and/or dependence on alcohol and/or psychoactive drugs.

NLAES also obtained information about the demographic characteristics of respondents and further information about their socioeconomic characteristics and labor force and employment experiences. Information about current employment status, hours of work, and personal earnings are particularly useful for this analysis. The earnings variables exclude receipt of unearned income, such as dividends and social welfare benefits. Variables usually employed in analyses of labor force participation, employment, and earnings were collected in the survey. These include age, gender and ethnic background (basic demographic characteristics), marital status, presence of children in household, and "human capital" factors (such as educational attainment and primary occupation).

The survey achieved a more than 90-percent interview response rate. The survey used a complex sampling design, with oversampling of young adults and the African-American population. The sampling design requires analyses to employ specialized statistical routines that adjust tests of statistical significance for these factors. As in the primary publications of NLAES findings (e.g., Grant et al. 1994), tests of statistical significance reported in this study have been performed using the SUDAAN software (Research Triangle Institute 1992).

5.3.5 The Prevalence of Alcohol, Drug, and Mental Disorders

In examining the relationship of alcohol and drug disorders to employment success, this analysis has examined both lifetime and past-year prevalence of the disorders in question. However, for theoretical reasons, the focus has been directed to lifetime diagnosis over current or past-year diagnosis. Theoretically, a history of a major health problem (be it a general health problem, alcohol or drug problems, or a mental health problem) could affect current labor market success by having previously interrupted either one's educational attainment or the expected progression of one's career. Of course, many health problems do not have major or lasting effects, or such effects are successfully remediated through clinically assisted or self-rehabilitation efforts. Thus, current labor market success could be affected even with no apparent current impairment.

The prevalence of alcohol and drug dependence and of major depression for the NLAES sample appears in table 5.8. In the total population analyzed in this study (adults ages 18 to 64, not full-time students), 21.3 percent of males and 10.2 percent of females had ever met criteria for alcohol dependence. The male and female rates for lifetime drug dependence among the 18- to 64-year-old population were 4.5 percent and 2.9 percent, respectively. Prevalence rates also have been calculated and reported for major depression, because mental illness is commonly co-occurring with substance abuse disorders. (Depression was the only mental disorder assessed in NLAES; it is one of the most prevalent mental disorders.)

The ever-alcohol-dependent population is also subdivided into those with early and later initiation of drinking. About 3.6 percent of males and 1.5 percent of females ages 18 to 64 had ever been alcohol dependent and had started drinking (more than just "sips") before their 15th birthday (termed "early drinkers" in this report). Analyses reported below indicate that this subset of the ever-alcohol-dependent population appears to experience the most substantial and/or lasting effects of alcohol problems on labor market success.

The prevalence rates of alcohol and drug dependence pertain only to individuals that ever met the diagnostic criteria for "dependence," whether or not they had also met criteria for the diagnosis of "abuse." An extensive series of exploratory analyses revealed that a diagnosis of "abuse" for alcohol or drugs was rarely significantly related to differences in employment success or in earnings or wage rates, and in a few regressions it actually had a positive association with these outcomes.

Co-occurrence of alcohol, drug, and depression disorders raises the possibility of interactions among the disorders—that is, persons with multiple disorders might experience effects that differ from the sum of the individual effects from the several problems that they experience. This hypothesis was tested. Although there was some evidence from the logistic and ordinary least squares regressions to support this for males (but not at all for females), there were relatively small numbers of observations (on the order of 100) in certain of the disorder-combination cells. Because of this sparseness of observations, the analysis did not examine interactions between alcohol dependence with early and later drinking initiation and other disorders.

Table 5.8

Lifetime Prevalence of Alcohol, Drug, and Depression Disorders, Persons Ages 18 to 64, by Gender

	NLAES Percent With Lifetime Diagnosis	
Diagnosis	**Males**	**Females**
Alcohol dependence	**21.3**	**10.2**
and early drinking	3.6	1.5
and later drinking	17.8	8.7
Drug dependence	**3.7**	**2.2**
Major depression	**9.9**	**13.3**

SOURCE: Analysis of the National Longitudinal Alcohol Epidemiologic Survey (NLAES) (adults ages 18 to 64, excluding full-time students).

5.3.6 Analyses

5.3.6.1 Analytic Approach

The primary hypothesis of this analysis is that persons meeting criteria for a diagnosis (either prior or current) of alcohol or drug disorders will have impaired productivity in the workplace and therefore are likely to have lower than expected

- Employment (i.e., having a job and/or hours of employment);
- Wage rates; and/or
- Earnings.

This analysis has taken a straightforward approach to modeling the relationship of the primary employment-related outcome measures (specifically, employment, earnings, and wage rates) with respect to the following:

- Standard demographic and socioeconomic predictors of employment outcomes; and
- Indicators of alcohol, drug, and mental illness disorders.

The analytic approach is generally consonant with the analyses identified and summarized briefly in section 5.3.3. The analysis is built upon single-equation analyses that essentially assume that causality flows from the independent, or predictor, variables on the right-hand side of the equation to the dependent, or outcome, variables on the left-hand side of the equation. This is the primary approach that has been taken in the study of this problem. The variables that are used in the regression analysis later in this section are identified in table 5.9.

A central issue in this analytic approach is whether the dependent variables and the independent variables (notably employment outcomes and alcohol and drug disorders, respectively) are simultaneously determined by the individual. In fact, it is theoretically possible and empirically likely that certain employment-related values and alcohol and drug consumption behaviors may be simultaneous, which would dictate alternative modeling approaches for estimation of those relationships.

Specifically, standard neoclassical theory of consumer and labor market behavior predicts that individuals with higher wage rates might well have higher consumption of most goods and services (including alcoholic beverages and even psychoactive drugs). This tendency is known as the “income effect” of higher wages. However, theory and empirical studies recognize that the “income effect” can well be offset by other factors, including the “substitution” effect of employees working less in order to “consume” more leisure. This analysis recognizes the theoretical possibility that individuals with higher wage and employment income may consume more alcoholic beverages and psychoactive drugs—which indeed a number of prior studies have found.

This analysis is directed at alcohol and drug disorders rather than consumption levels. “Disorders” refers to the specific sets of symptoms related to intensive and/or extensive use of alcohol and/or psychoactive drugs that meet established clinical standards for existence of alcohol or drug disorders. As noted above, NLAES was designed around the DSM–IV clinical standards to allow potential diagnoses to be assigned to NLAES respondents based on their answers to specific sequences of questions concerning alcohol and drug experiences and symptoms.

Disorders are theorized to be less subject to the endogeneity and simultaneous equations problems that exist with consumption variables. Specifically, users do not generally decide to have alcohol and drug disorders, although they do make choices about levels of consumption before the disease process is initiated. This analysis maintains the hypothesis that alcohol or drug dependence or abuse are undesired, undesirable, and generally unexpected consequences of consumption. Although dependence and abuse are certainly related to levels and patterns of consumption, there is increasing evidence that dependence and abuse are disorders that have components of genetic vulnerability (NIAAA 1997). Thus, two individuals who have identical drinking (or psychoactive drug use) patterns may have quite different probabilities of experiencing alcohol and drug disorders.

Table 5.9

Variables Used in the Regression Analyses

Dependent Variables	Primary Alcohol and Drug Variables	Control Variables
• *Employment* in past month • *Earnings* in past month • *Wage rate* (earnings/hours worked)	*Variables used in reported models* • Alcohol dependence and early drinking and later drinking • Drug dependence ever *Variables tested in models not reported* • Alcohol dependence: current; prior to past year • Alcohol abuse: current; prior to past year • Alcohol consumption (current) • Drug dependence: current; prior to past year • Drug abuse: current; prior to past year	*Reduced model* • Gender • Age • Ethnic background • Rural/urban residence • Children in household • Depression disorder ever *Full model adds these variables to the reduced model* • Educational attainment • Skilled profession • Marital status

In a formal sense, measures of alcohol and drug disorders are more appropriate for empirical analyses as "exogenous" (i.e., predetermined) variables than are measures of alcohol or drug consumption because disorders are undesired and undesirable outcomes that happen with uncertain probability.

NLAES has further detail about whether the respondent met criteria for alcohol/drug dependence/abuse either within the year preceding the interview or at any time previously. The analyses explored the various alternative measures. This analysis has primarily used "lifetime" measures, meaning whether the individual had ever met the diagnostic criteria in his or her life. However, exploratory analyses also examined the impact of "current" disorders (i.e., meeting diagnostic criteria for the disorder during the year prior to the interview). This report presents estimates for the measures that were most robust and consistent in the empirical results. Limited discussion is given to the findings for the alternative measures.

5.3.6.2 Analytic Results

The analyses have used logistical regressions and ordinary least squares regressions to examine whether persons with alcohol and/or drug disorders differ from the general population in terms of the following:

- Employment rates; and
- Earnings per hour (monthly earnings divided by hours worked).

Analyses have been performed separately for males and females. It is well established in the labor market literature (and the findings reported here support) that males and females have fundamentally different experiences with respect to labor force participation, employment, wage rates, and earnings, which warrant separate analyses.

This study has also examined "reduced model" as well as "full model" effects. Reduced model estimates are those in which only basic demographic factors have been included as control variables to estimate the effect of alcohol and drug disorders as well as major depression. Full model estimates include additional variables as control factors that are generally considered measures of "human capital" (specifically educational attainment, choice of a white-collar profession, and marital status) and that strongly predict outcomes such as labor force participation, employment, and wage rates.

Estimated effects generated using both reduced models and full models are presented in order to demonstrate the apparent correlation between alcohol and drug disorders and the human capital variables. Effects estimated using reduced models are consistently greater than effects estimated with full models. This indicates that individuals with alcohol and drug disorders tend to have lower levels of educational attainment and/or selection into skilled professions. Because a key mechanism through which alcohol and drug disorders may achieve negative effects on labor market success is adverse effects on human capital (e.g., educational attainment and choice of occupation), it is justified to estimate alcohol and drug disorder effects using the reduced models (Mullahy and Sindelar 1989).

Also, regression analyses have been performed that include only a single measure of alcohol or drug disorders (summarized in table 5.10) and that include both major disorder variables (summarized in table 5.11). These separate sets of regressions have used the same observations. The single- and multiple-disorder regressions have been performed in order to identify effects on employment and the level of earnings among people with alcohol or drug dependence, ignoring the co-occurrence of the other disorders. In developing cost estimates—and in estimating disorder-specific effects—use is only made of the logistic and ordinary least squares regressions that simultaneously include alcohol and drug disorders as well as depression in order to separate their effects. Appendix B includes additional information regarding regressions that were completed.

5.3.6.2.1 Single-Disorder Impact Estimates

Results from 24 separate logistic and ordinary least squares (OLS) regressions are summarized in table 5.10. Each "cell" of coefficients in the table represents a separate regression. In the following sections "alcohol dependence" and "drug dependence" means dependence at any time in the respondents' lifetimes (i.e., "ever"). For style purposes, the rest of this chapter will drop the modifier "ever."

For males, alcohol dependence appears to not be a significant predictor of an individual's employment status (logistical regression, with employed = 1 and unemployed or not in the labor force = 0). The values on the left of table 5.10 are coefficients from logistical regressions. Statistically significant coefficients are indicated with asterisks.

However, when alcohol-dependent males are divided into "early drinkers" (first drink before reaching age 15) and "late drinkers" (first drink at age 15 or older), it is seen that alcohol dependence is strongly correlated with lower than expected employment for early-drinking males. Later drinking is not negatively associated and even may be positively associated. The reduced model yields larger negative impacts from dependence with early drinking than does the full model.

Earnings did appear to be negatively affected by alcohol dependence, both in association with early and later drinking initiation (the right of table 5.10). However, early initiation with dependence clearly has a stronger impact than does late initiation with dependence.

Drug dependence (ever in one's lifetime) is not significantly associated with employment status for males in either the reduced or the full model. Drug dependence does have a negative and significant association with reduced wage rates and earnings, and the estimated impact is lower in the full model than in the reduced model, as predicted by theory.

Results for females are equivocal. This is consistent with many prior studies of alcohol and drug disorders and female labor market success. Although alcohol dependence has a mild positive, but statistically insignificant, correlation with employment status and wage rates, females with dependence and early drinking are less likely to be employed than are their counterparts with no history of alcohol dependence. However, the estimate is of only marginal statistical significance. None of the estimates of the effects of alcohol dependence on females' wage rates approached statistical significance.

Drug dependence is a strong and statistically significant predictor of lower employment among females. The magnitude of the impact is slightly less than for alcohol dependence with early drinking. However, it is more statistically significant, probably because there are almost twice as many women with drug dependence as with alcohol dependence combined with early drinking. Female wage rates do not appear to have a statistically significant association with drug dependence.

Table 5.10

Regression Results for Single-Disorder Impact Estimates
(each cell represents a separate regression)

Alcohol or Drug Use Disorder	Logistic Regression: Earnings Past Month > 0		OLS Regression: ln (Earnings/Hr Past Month)	
	Reduced Model	Full Model	Reduced Model	Full Model
Results for Males				
Alcohol dependence	-0.029 (0.069)	0.096 (0.075)	-0.082 (0.018)**	-0.050 (0.017)** Φ
Alcohol dependence and early drinking	-0.440 (0.156)**	-0.306 (0.167)*	-0.178 (0.048)**	-0.099 (0.045)**
and later drinking	0.109 (0.067)	0.161 (0.073)**	-0.065 (0.025)*	0.041 (0.022)*
Drug dependence	-0.149 (0.166	-0.034 (0.169)	-0.153 (0.036)**	-0.098 (0.034)* Φ
Alcohol dependence	0.035 (0.073)	0.010 (0.071)	-0.042 (0.025)	-0.043 (0.023) Φ
Alcohol dependence and early drinking	-0.346 (0.177)*	-0.323 (0.180)*	-0.046 (0.083)	-0.011 (0.079)
And later drinking	0.083 (0.075)	0.046 (0.075)	-0.041 (0.040)	0.047 (0.037)
Drug dependence	-0.283 0.106)**	-0.255 (0.107)**	-0.054 (0.046)	0.008 (0.043) Φ

SOURCE: Analysis of National Longitudinal Alcohol Epidemiologic Survey.

NOTES: Other variables included in the reduced model are age, age squared, ethnicity, rural/urban residence, and the number of children living in the individual's household. Other variables in the full model include educational attainment, marital status, and whether the stated occupation was a skilled profession.

"Early drinking" means initiation of drinking (other than "sips") before reaching age 15. "Later drinking" means initiation of drinking at age 15 or older.

Values in parentheses are standard errors of the coefficients.

SUDAAN software was used to correct standard errors for sampling design.

* indicates significance at 0.10 level.

** indicates significance at 0.05 level.

Φ indicates that the estimated standard error was not corrected for the sampling design (estimated with SAS). Such correction leads to increases in estimated standard errors of up to 20 percent.

5.3.6.2.2 Multiple-Disorder Effect Estimates

Because of frequent co-occurrence of alcohol and drug use and depressive disorders, it is important to simultaneously estimate the respective efects. For example, estimates of the impact of drug dependence alone may be inflated because many of these individuals also have alcohol use disorders. For this reason, the single-disorder estimates presented immediately above may overstate the effects of these respective disorders. Table 5.11 presents the results of the multiple-disorder impact estimates, where variables representing alcohol and drug use disorders as well as depressive disorders are simultaneously included in the regressions along with the selected control variables (those in either the reduced model or the full model). As expected, the estimates in table 5.11 are generally smaller in magnitude and less likely to be statistically significant than the impacts reported in table 5.10.

The first finding (regression 1 in table 5.11) is that males with alcohol dependence and early drinking are significantly less likely to be employed than males otherwise having the same demographic characteristics—even the same drug use and depressive disorders. This effect loses statistical significance when human capital variables are added (the full model). Moreover, it appears that alcohol-dependent males with later drinking initiation have higher rates of employment than similar males with no history of alcohol dependence.

For males, drug dependence appears not to be a significant predictor of employment in the multiple-disorder analyses (regressions 1 and 2), in contrast to the findings of the single-disorder analyses. Tabulations not reported here found that about 70 percent of males with drug dependence also have an alcohol disorder. It would appear that much of the single-disorder impact for drug dependence detected in table 5.10 is a result of the fact that these individuals had co-occurring alcohol use disorders.

The multiple-disorder results in regressions 3 and 4 of table 5.11 ratify the earlier findings (table 5.10) that male wage rates are negatively associated with alcohol dependence, with greater effects for those with early initiation of drinking than for those with later drinking initiation. Once more, the full model (including human capital control variables) yields impact estimates that are materially smaller as well as statistically insignificant.

For females, the equivocal results of table 5.10 are nearly replicated in table 5.11. The only impact that is statistically significant for females is that of drug dependence (regression 5) on the probability of employment. Inclusion of human capital control variables (the full model) does not materially diminish the estimated impact in magnitude or significance. Although there is an apparently negative impact of alcohol dependence with early drinking initiation on expected employment that has nearly the same magnitude as the drug dependence effect, it is not statistically significant. As alluded to previously, there are relatively few females in the sample with alcohol dependence and early drinking initiation.

Table 5.11

Regression Results for Multiple-Disorder Impact Estimates

(each cell represents a separate regression)

Alcohol or Drug Use Disorder	Logistic Regression: Earnings Past Month > 0		OLS Regression: ln (Earnings/Hr Past Month)	
	Reduced Model	Full Model	Reduced Model	Full Model
Results for Males				
	Regression 1	*Regression 2*	*Regression 3*	*Regression 4*
Alcohol dependence and early drinking	-0.390 *(0.171)***	-0.274 *(0.180)*	-0.140 *(0.049)***	-0.070 *(0.046)*
and later drinking	0.137 *(0.072)**	0.180 *(0.077)**	-0.045 *(0.025)**	0.026 *(0.023)*
Drug dependence	-0.133 *(0.189)*	-0.062 *(0.191*	-0.099 *(0.048)***	-0.061 *(0.046)*
Results for Females				
	Regression 5	*Regression 6*	*Regression 7*	*Regression 8*
Alcohol dependence and early drinking	-0.258 *(0.184)*	-0.225 *(0.188)*	-0.025 *(0.086)*	-0.001 *(0.082)*
and later drinking	0.119 *(0.077)*	0.091 *(0.077)*	-0.031 *(0.041)*	-0.040 *(0.039)*
Drug dependence	-0.298 *(0.111)***	-0.250 *(0.113)***	-0.028 *(0.046)*	-0.042 *(0.043)*

SOURCE: Analysis of National Longitudinal Alcohol Epidemiologic Survey.

NOTES: Other variables included in the reduced model are age, age squared, ethnicity, rural/urban residence, the number of children living in the individual's household, and history of major depression. Other variables in the full model include educational attainment, marital status, and whether the stated occupation was a skilled profession.

"Early drinking" means initiation of drinking (other than "sips") before reaching age 15. "Later drinking" means initiation of drinking at age 15 or older.

Values in parentheses are standard errors of the coefficients.

SUDAAN software used to correct standard errors for sampling design.

* indicates significance at 0.10 level.

** indicates significance at 0.05 level.

5.3.7 Productivity Losses Due to Alcohol and Drug Disorders

The estimation of lost productivity due to alcohol and drug disorders is described in this section and summarized in table 5.12. Specifically, it is estimated that the cost in terms of lost potential productivity due to alcohol disorders was $66.7 billion in 1992 and was $14.2 billion for drug disorders. These estimates are composed of separate estimates for males and females and separate estimates for the effects of alcohol and drug disorders on employment/nonemployment and on earnings. Estimates have been developed using the microsimulation techniques developed for and employed in many analyses of the RAND Health Insurance Experiment (Newhouse and the Health Insurance Group 1993; Manning et al. 1987; Duan 1983).

This is a materially different approach to the development of these estimates than has been employed in the prior studies of the costs of alcohol and drug dependence. The alternative, prior approach (which is also the approach that has been used in many studies of welfare and health care reform) develops estimates based on applying the impact estimates (proportional effects either on the probability of employment or on wage rates) reported in the prior section to general population averages for rates of employment or earnings (including the value of fringe benefits) by age and gender groups. This general approach was taken in Rice et al. (1990) and in the prior studies of the economic costs of alcohol and drug abuse that examined effects on employment and earnings. The RAND microsimulation methodology is an alternative approach to development of such estimates.

The RAND microsimulation technique involves a series of procedures intended to improve the precision of estimated effects (whether for insurance design or health disorders). The application to alcohol and drug dependence involves comparing the expected value of earnings for an individual who is alcohol or drug dependent with his or her expected earnings in the absence of the alcohol or drug disorder. The difference between these two values is the estimated impact of the disorder on the individual, and the sum of these estimated impacts across all individuals with alcohol or drug disorders is the estimated national total impact.

The technique involves performing regressions similar to those reported in tables 5.10 and 5.11 to analyze the earnings of the alcohol- and drug-dependent populations, respectively, and of the non-alcohol- or non-drug-dependent population. Then, for a given alcohol- or drug-dependent individual, his or her expected value of earnings when alcohol- or drug-dependent is derived from the results of the regression on the alcohol- or drug-dependent population (regression packages will compute the "expected" or predicted value for an observation in a regression as well as the difference between the predicted/expected value and the actual value). In contrast, the expected earnings for each alcohol-dependent individual under the counterfactual assumption of never having been alcohol dependent is derived from the regression results from the non-alcohol- or non-drug-dependent population, respectively. This is done by applying the earnings regression coefficients from the non-alcohol-dependent population to the independent variable values for the individual alcohol-dependent observations. Summing these two expected values for the alcohol-dependent population (applying appropriate sampling weights) yields the national expected earnings for the alcohol-dependent population and their expected value if they had never been alcohol dependent. The difference in the two values is the estimated national impact.

An additional step in this RAND microsimulation technique is adjustment of predicted/expected values from the regressions for the "retransformation" bias (Duan 1983) that results from estimation of effects using log-linear models (which is both theoretically and empirically justified for the analysis of earnings). This step is necessary in order to address the retransformation problem as well as to protect against statistical issues such as heteroscedasticity in the data.

The costs for alcohol disorders were entirely for males. There were no statistically significant effects of alcohol disorders for females in the primary (multiple-disorder) analyses.

An important finding of this study is that early initiation of drinking (taking a first drink other than "sips" by age 15) combined with ever having met criteria for a diagnosis of alcohol dependence appears to have the strongest impact on employment success. In 1992, there were an estimated 2.66 million males who were not then full-time students and who met these criteria. An estimated 2.12 million of these were employed during the survey month, and on average they earned 13.1 percent less than would have been expected in the absence of their history of alcohol dependence. There were an additional 13.15 million males with a lifetime history of alcohol dependence (but with initiation of drinking after age 14), and an estimated 11.5 million of these were employed. This group experienced earnings that were estimated at 4.4 percent lower than they would have been in the absence of their history of alcohol dependence

The microsimulation techniques yielded estimates of expected monthly earnings of $2,514 for the 13.6 million employed males with dependence ever in their lifetimes. Their expected monthly earnings if healthy were $2,775, indicating a monthly loss of earnings of about $260 (9.4 percent). This set of estimates includes "smearing" adjustments of 1.348 and 1.398, respectively, for these two estimates, which has the impact of increasing the magnitude of the earnings loss estimate from about a 6-percent deficit (weighting the early and later drinkers together) to more than 9 percent. Note that this adjustment is necessary because the regression is done on "logged" dollars, which must be translated to "normal" dollars. The smearing factor can also be interpreted as adjusting for heteroscedasticity in the error term (Duan 1983). Heteroscedasticity can cause inefficient estimates of effects. Before the smearing adjustments, the expected monthly earnings of the alcohol-dependent males were $1,865 and $1,985 if never dependent (a 6.0-percent difference).

The total estimated productivity loss for employed, ever-alcohol-dependent males was $66.706 billion for 1992. Lost earnings for employed males ages 18 to 64 are equal to 13.6 million employed males x $260 loss per month x 12 months x 1.40 (to account for average fringe benefits beyond wages and salaries) x 1.1206 (to account for expected household productivity of employed males). The estimate of the contribution from fringe benefits is from studies on the cost of employee compensation (Braden and Hyland 1993), which find that employer-paid fringe benefits, such as paid leave, insurance, retirement and savings, and legally required contributions, are worth another 40 percent of the employee's wage or salary. The estimate of expected household productivity is based on data from Dorothy Rice (1997, personal communication) and the value represents the expected ratio of the value of employed males' household productivity contributions compared with market productivity (earnings plus fringe benefits), adjusted for the age distribution of males with lifetime alcohol dependence.

Males with a history of drug dependence are also estimated to have experienced productivity (and earnings) losses. The same method of estimation was used as for alcohol-dependent males. There were an estimated 2.85 million employed males with a history of drug dependence. The microsimulation estimated their expected monthly earnings at $2,356, against an expected value of $2,552 if they had never been drug dependent, yielding a loss of $196 per month (7.7 percent). As in the case of alcohol dependence, the smearing adjustment increased the estimated impact of drug dependence from 3.8 percent to 7.7 percent (the smearing factors were 1.334 and 1.390, respectively). The estimates of affected males and earnings losses must be adjusted from monthly to annual rates and incorporate the factors for fringe benefits and expected household productivity. This yields an estimated loss of $10.538 billion for ever-drug-dependent males.

Females have generally demonstrated weak or insignificant effects of alcohol and drug dependence on earnings, both in this study and in the prior reports. As discussed above, the only statistically significant effect for females is the impact of drug dependence on the probability of being employed. This loss has been estimated with the same microsimulation technique, with the additional calculation of expected probability of being employed for ever-drug-dependent women, based on the ever-drug-dependent and never-drug-dependent samples, respectively.

There were an estimated 2.1 million ever-drug-dependent females ages 18 to 64 not enrolled full time in school. There is no estimated negative impact on earnings (if employed) of ever-drug-dependent females (nor is there for alcohol): Expected monthly earnings for this population are $1,604 (including the smearing adjustment). However, women with a history of drug dependence have an expected employment rate of 62.7 percent, compared with a predicted rate of 69.0 percent if they had no history of drug dependence. This difference in expected level of employment translates into a loss of earnings of $102.50 per month averaged across the total 2.1 million women with and without employment. This translates into an estimate that about 136,000 ever-drug-dependent females were unemployed who would have been expected to have been employed if their experience had been like the non-drug-dependent population. The corresponding estimated loss of market productivity is $3.677 billion. No impact is estimated for loss of household productivity because no deficit was found in earnings among those employed.

It is highly noteworthy that among those males with a history of dependence on alcohol, the most severe effects were among individuals with early initiation of drinking (prior to age 15). The regression analyses (regressions 1 through 4) appear to indicate that a potential avenue through which early drinking operates on employment success is through negative effects on academic achievement. The analyses that omit the education variable consistently demonstrate effects of a larger magnitude than do those that control for education. This indicates that early drinking/ever dependent is correlated with lower educational attainment. This finding suggests a further reason to emphasize prevention efforts among adolescents.

Table 5.12

Summary of Estimated Productivity Losses in the Workforce Due to Alcohol and Drug Disorders, 1992

Gender Group	Nature of Impact	Basis for Estimate	Labor Market Status/ Diagnosis	No. of Persons With Loss (in millions)	Size of Impact (percent)	Cost to Society (billions of dollars)
ALCOHOL DISORDERS						
Males	Lower wages/ productivity	Regression 5	Employed, ever alcohol dependent—1st drink by age 15	2.117	13.1*	23.631
Males	Lower wages/ productivity	Regression 5	Employed, ever alcohol dependent —1st drink after age 14	11.489	4.4*	43.075
Females	No statistically significant impacts					
Subtotal, Alcohol				**13.569**		**$66.706**
DRUG DISORDERS						
Males	Lower wages/ productivity	Regression 5	Employed, ever drug dependent	2.855	9.4 *	$10.538
Females	Excess unemployment	Regression 7	Unemployed, ever drug dependent	.136	7.1*	$3.677
Subtotal, Drug Abuse				**3.006**		**$14.205**
TOTAL				**16.575**		**$80.911**

*These estimates are from the regression analysis above. They were not directly used in development of the cost estimates on this table. A microsimulation technique was employed that estimated expected earnings and/or employment for the alcohol- and drug-dependent populations, respectively, when dependent and not affected by alcohol or drug dependence.

5.3.8 Discussion

This analysis of the NLAES data has yielded new estimates of the nature and magnitude of effects of alcohol and drug disorders on employment. In several important respects this analysis represents an advance over prior analyses of this issue. The most notable improvements are that NLAES incorporates the most current diagnostic criteria (DSM–IV) for determination of alcohol and drug disorders and that the survey obtained data on earnings that excluded unearned income. Also critical is that this survey presents a recent (1992) picture of alcohol and drug use and disorder patterns. The survey gives equally rigorous attention to assessing both alcohol and drug disorders. Also, it assesses whether individuals had experienced episodes of depression that met DSM–IV criteria. Depression is a frequently co-occurring disorder with alcohol and drug disorders.

The major finding is that the strongest negative effects of alcohol dependence on earnings are experienced by individuals who began drinking before age 15. Although a history of alcohol dependence by itself is predictive of moderately reduced wage rates for employed males, this is merely an average of the stronger impact for early drinkers with the materially smaller impact for those who began drinking later. This suggests that alcohol prevention efforts that delay initiation of drinking may somewhat ameliorate the negative employment impacts that may be associated with alcohol dependence. Exploratory analyses also examined whether early initiation of drug use was associated with greater impacts; however, these analyses were inconclusive.

This study has not searched exhaustively for other patterns of alcohol or drug disorders that might be more strongly and negatively associated with employment and earnings. The finding that early drinkers with alcohol dependence disorders have stronger negative effects suggests that further analysis of the very rich NLAES data base may yield further insights. This is only logical, since the dependence and abuse measures were developed to identify individuals that might experience problems across a broad range of life experiences, rather than solely on employment impacts.

It is important to note that beyond alcohol dependence, other patterns of alcohol consumption and problems (e.g., abuse) were not negatively and significantly associated with effects on employment and earnings. Virtually all of these other variables were insignificant when they were tested in reduced or full models, and many of these variables were even positively correlated with employment and earnings. This was true for measures of current consumption and even for measures of alcohol abuse (either current or lifetime) without concurrent dependence.

These estimates are only modestly greater (by about one-third) than the estimates in Rice et al. (1990), which used the ECA survey from the early 1980's. That study estimated 1985 alcohol costs at $27.2 billion and drug costs at $5.9 billion, which would equal about $50 billion and $11 billion, respectively, if projected to 1992, versus the estimates in this study of $66.7 billion and $14.2 billion, respectively. Among the notable differences is that the Rice et al. (1990) study included both alcohol abuse and dependence in the prevalence estimates. However, NLAES appears to yield higher estimates of the prevalence of lifetime alcohol dependence than does the ECA survey. This analysis has not found significant negative employment effects associated with alcohol abuse, and in certain analyses, alcohol abuse is positively correlated with employment outcomes.

Most important, the Rice et al. (1990) study used a quite different approach to measure alcohol and drug effects, which directly lead to lower estimates of effects than would otherwise be expected. Rice et al. (1990) applied both their "timing" technique and the "indicator" method used in this and most other studies of this issue (see section 5.3 above).

An important area for further exploration is the fact that ECA assessed a wide range of mental disorders, whereas NLAES assessed only depression. This analysis did control for depression, finding consistently negative and often statistically significant effects on earnings. This is quite in contrast with the findings in the ECA analysis, which actually detected strong positive correlations between affective disorders and personal income.

As reported in earlier studies, females appear to have few significant employment-related effects from alcohol and drug disorders. It is likely that more complex models will be necessary in order to understand whether and how alcohol and drug disorders among women may correlate with employment outcomes. More sophisticated modeling of female labor market decisions requires incorporation of elements for marital status combined with fecundity. These elements are not nearly as significant in modeling the labor market experiences of males.

5.4 Lost Earnings While Institutionalized and Hospitalized

The estimated loss of potential productivity because of long-term residential treatment and short-term hospitalization of alcohol and drug abusers was $3 billion in 1992; drug problems cost $1.5 billion, and alcohol problems, $1.5 billion.

There were an estimated 63,800 clients in long-term residential alcohol and drug abuse treatment programs on a given day in 1991 (Harwood et al. 1994). Most clients enrolled in long-term treatment programs are not allowed to hold jobs until very near the end of their treatment stay, so enrollment in treatment amounts to a temporary loss of potential employment. It was estimated in Harwood et al. (1984) that the average loss of potential productivity per person-year from long-term treatment was $24,600 after adjustments for expected rates of labor force participation, unemployment, and household productivity. Wage rates of nonmanagerial workers increased 59 percent between 1980 and 1992, yielding annual potential productivity of $39,000. This has been arbitrarily adjusted downward by about 10 percent, to $35,000, because the treatment population in 1991 was somewhat younger on average (median age of 31 years versus 34 years) and had a slightly greater proportion of females (24 percent versus 22 percent).

Total loss of potential productivity resulting from long-term residential treatment of alcohol and drug abusers was thus estimated at $2.233 billion in 1992. Losses for clients with primary drug problems were $694 million, whereas losses for clients with primary alcohol problems were $577 million and losses for clients with both drug and alcohol problems were $962 million. When the costs for the dually affected clients were prorated (among those with a single problem, about 55 percent had drug problems and 45 percent had alcohol problems), the loss attributed to drug problems was $1.222 billion (54.6 percent), versus $1.011 attributed to alcohol problems. It should be noted that in 1980 almost 80 percent of these costs were attributed to clients with primary alcohol problems (Harwood et al. 1984). Although it appears that the proportion of individuals in long-term residential alcohol and drug abuse treatment who had alcohol problems (counting primary alcohol plus combined alcohol and drug) declined from 80 percent in 1980 to almost 70 percent in 1991, it is difficult to attach broader significance to this finding. There have been major institutional changes in the organization, delivery, and financing of alcohol and drug abuse treatment as well as changes in prevalence patterns over the period of concern that obviate facile interpretation.

Patients spent almost 6.9 million days (18,800 patient-years) in hospitals in 1992 for treatment of alcohol and drug abuse and related health problems (see chapter 4 for the calculations and discussion). Again, this represents a loss of potential productive time, which can be assigned a value in the same manner applied to patients served in long-term residential substance abuse treatment facilities. For simplicity, the assumption is being made that the demographic characteristics of those in hospitals receiving treatment related to alcohol and drug problems were similar to characteristics of those served in residential specialty facilities, with an opportunity cost of their time equal to $35,000 per year. This yields estimated costs of $757 million for 1992, with $502 million for alcohol abuse and $255 million for drug abuse based on the diagnoses associated with care delivered in hospitals.

5.5 Lost Earnings Among Fetal Alcohol Syndrome Victims

Based on the assumption of a 1-in-1,000 incidence rate among these birth cohorts (see chapter 4), there were an estimated 144,000 adult survivors of FAS in 1992 (ages 22 to 65). As discussed in chapter 4, many FAS victims suffer long-term developmental disabilities, hearing loss, and other physical ailments. The estimates in this section are updates of estimates provided by Harwood et al. (1984), with adjustments only for population growth and price change between 1980 and 1992. About 2.5 percent of FAS victims are severely mentally retarded, and labor force participation among even the mildly developmentally disabled is lower than among nondisabled persons. However, the large majority of FAS victims are assumed to experience only "minimal brain dysfunction" (52.5 percent) or mild mental retardation (37.5 percent), with assumed rates of productivity impairment of 10 and 25 percent, respectively. Adjusting for wage inflation since the last study of earnings among FAS survivors (Harwood and Napolitano 1985), it is assumed that in 1992, the average FAS survivor earned $6,900 less than non-FAS victims. Totaled across the adult population with FAS, it is conservatively estimated that FAS cost society $990 million through lost earnings.

5.6 Crime-Related Productivity Losses

Losses in productivity due to crime and its effects cost society an estimated $45.6 billion in 1992, of which $6.4 billion is attributable to alcohol-related problems and $39.2 billion is attributable to drug problems. Three types of productivity-related costs of crime are estimated in this study:

(1) the value of lost work time for victims of crime; (2) productivity losses for individuals incarcerated in prisons as a result of conviction for an alcohol- or drug-related crime; and (3) productivity losses for those who engage in crime as a career because of their addiction to heroin or cocaine. The value of these productivity losses has been calculated using the methodology and basic approach developed in Cruze et al. (1981) and applied in Harwood et al. (1984) and Rice et al. (1990).

These values represent losses of potential productivity to the economy. For victims of crime, it is understandable that they would often lose work days (or their primary activity) because of injuries, time for reporting crimes, inconvenience, and related reasons and that this would entail a net loss of earnings and productivity. According to the National Crime Survey (NCS; U.S. Department of Justice 1994b), there were 33.6 million victimizations in 1992, which involved loss of an average of about 2.5 "work" days each (excluding homicides, which are accounted for in section 5.2 on mortality). Separate estimates have been developed for the various types of crime tracked in the NCS. For each type of crime, the calculation multiplies the number of offenses in 1992 by the average number of work-loss days. The total number of work-loss days is multiplied by an estimated loss of (market plus nonmarket) productivity of $133 per lost work day (which is weighted for gender and age distribution). For each type of crime, attribution factors are applied for alcohol and drug abuse, respectively (these are discussed and documented in chapter 6), to estimate the value of losses from these two causes. This yields a total estimated loss of $3.1 billion ($1 billion for alcohol and $2.1 billion for illicit drugs; see detailed calculations in appendix B, table B.5).

Prisoners also represent a loss of potential productivity to society, since few prisoners can work. Moreover, there is some question about the nature and value of such losses. Prior studies have estimated the loss of potential productivity while incarcerated as equal to the average realized by the general population—that is, average rates of employment and average productivity/wage rates.

However, it is arguable that even if they were not incarcerated, many of these individuals might still have had poor success in the legitimate labor market. This is very possibly related to their problems with alcohol and drug abuse. (Note that lost productivity of alcohol and drug abusers in the general population is discussed in section 5.3 and in the text immediately following; the calculations are designed to avoid double counting of losses.) By this line of logic, the loss of potential market plus nonmarket productivity might be much less than the value for the general population because it is anticipated that they would have higher than average unemployment rates and/or lower than average wage rates.

This rationale is not adopted in the current study. The calculations are based on the assumption that in the absence of drug and alcohol abuse, prisoners' potential productivity would be equal to the productivity of the general population. This is because even without incarceration there is a loss equal to the difference in productivity for alcohol and drug abusers compared with values for the general population. This difference already constitutes a cost to society. The impact of incarceration is to simply drive productivity for such an individual even lower—that is, to zero. Thus, while the incremental productivity-related cost of incarcerating such a person is only a portion of the potential productivity for a member of the general population, to this must be added the cost representing the productivity decrement such a person experiences even when available for the labor market. This distinction is critical because the incarceration cost component does not estimate the added productivity-related cost of incarceration so much as it estimates the loss of productivity associated with those individuals who are incarcerated. Those individuals have a total loss of potential expected productivity because their current and past alcohol and drug problems reduce their expected productivity when they are available for the labor market, and even this lower productivity is lost due to incarceration.

This logic is strengthened by analyses that find that a major impact of early initiation of drinking and drug use can be to reduce educational attainment. Poor education limits success in the labor market. Most studies of offender populations have found both early onset of drinking and drug use and high dropout rates. It is plausible that these may be causally linked.

The value of reduced productivity for those incarcerated in prisons has again been calculated using the methodology developed by Cruze et al. (1981), with the application of new and updated attribution factors as discussed in chapter 6. The detailed calculations appear in appendix B. There were 1.3 million person-years spent in prisons and jails in 1992. Total person-years by type of offense (by gender) were multiplied by the appropriate attribution factor to yield an estimate of about 600,000 person-years incarcerated during 1992 due to alcohol- and drug-related offenses. The resulting total person-years were multiplied by the average expected annual productivity (market plus nonmarket) of about $40,000 per year for males and $26,000 for females (including adjustments for expected labor force participation and employment). The total value of lost productivity due to incarceration is estimated at $23.4 billion ($5.5 billion for 140,000 person-years for alcohol-related offenses and $17.9 billion for 460,000 person-years for drug-related offenses).

Drug-related crime careers represent another major avenue through which potential market productivity is lost. This cost comes from individuals largely forsaking the legitimate economy to obtain income through trafficking in drugs (a per se drug-defined activity/cost) or in order to obtain income for illicit drugs from other criminal activities, such as acquisitive crimes, consensual crimes (e.g., gambling or prostitution), and receiving and trafficking in stolen property. There are no comparable costs hypothesized for alcohol because there is very little trafficking in illicit alcohol currently and because alcohol, which is relatively inexpensive compared with illicit drugs, is affordable at legitimate wages and should not motivate a change in career to pursue income-generating crime.

The total value of lost productivity due to drug-related crime careers (men plus women) is estimated at $19.2 billion. This estimate was calculated based on the estimate that there were about 1.7 million heavy drug users in the United States in 1992 (Rhodes et al. 1995). The prior studies estimated that there were about 1.2 million heavy drug users. Following the earlier studies, it was estimated that about 600,000 of them withdrew from the labor market to pursue predatory crime and/or drug dealing (estimate derived from analysis of the Treatment Outcomes Prospective Survey [TOPS] reported in Harwood et al. [1984]). This loss is based on the models of criminal behavior that Goldstein (1985) has labeled “economic compulsive” and “systemic”: The crime is committed to support one’s use of expensive drugs, or one engages in the drug distribution system primarily to earn a living.

The United States is estimated to have 1.7 million heavy drug users (Rhodes et al. 1995), including:

- About 500,000 opiate addicts (virtually identical to the estimates used in all prior U.S. cost-of-illness studies), and
- About 1.2 million heavy or dependent users of other drugs, primarily cocaine (twice as many as in the most recent cost-of-illness studies by Rice et al. [1990] and Harwood et al. [1984]).

Studies of drug addicts enrolled in treatment have found that they generally have low levels of employment, high rates of referral from criminal justice authorities, and if asked, high levels of involvement in income-generating illegal activities. Comparably undesirable rates on these factors for drug addicts enrolled in treatment have been reported in the California Drug and Alcohol Treatment Assessment (Gerstein et al. 1994), the Treatment Entry and Discharge System (TEDS; SAMHSA 1997), and in the National Treatment Improvement Evaluation Study (NORC 1996). These rates have been generally consistent with estimates applied in Harwood et al. (1984) from TOPS (Hubbard et al. 1989). Primarily to maintain comparability with Harwood et al. (1984), this study has again used the findings from TOPS on the proportion of opiate and nonopiate addicts estimated to withdraw from the legitimate labor force (54 percent and 46 percent of males and 39 and 29 percent of females, respectively). The prior estimate of average potential productivity was adjusted for changes in wages/productivity of 59 percent.

Thus, the current estimate is a direct extrapolation from the prior study that uses virtually the same number of opiate abusers (500,000 addicts), about twice as many addicts/heavy users of other drugs (from 600,000 to 1.2 million), identical demographic distributions, and an increase in per-addict loss equivalent to the increase in nominal wages of 59 percent from 1980 to 1992.

6. OTHER EFFECTS ON SOCIETY

6.1 Synopsis

Alcohol and drug abuse cost society an estimated $86.1 billion from direct costs and losses in productivity related to crime, social welfare expenditures, motor vehicle crashes, and fire destruction. Drug abuse is estimated to have cost $57.5 billion of these non-health-related costs, and alcohol abuse is estimated to have cost another $28.7 billion (see table 6.1).

Principal among these costs are the costs of crime. In 1992, alcohol and drug abuse caused an estimated 25 to 30 percent of violent crimes and property crimes (depending on the specific type of crime). Direct costs of alcohol- and drug-related crimes, including police and private protection services, adjudication, corrections, and property destruction, were estimated at $24.3 billion. Another $45.6 billion was incurred as lost productivity among crime's victims, incarcerated offenders, and persons who engage in crime careers rather than the legitimate labor market. Nearly 600,000 person-years were served because of alcohol or drug abuse-related offenses (a loss of $23.5 billion in potential productivity) and another 600,000 persons withdrew from the legitimate labor market primarily to pursue income-generating crime and/or drug dealing (a loss of $19.2 billion in potential legitimate productivity). The productivity losses resulting from crime were discussed in chapter 5.

This study also estimates that alcohol and drug abuse caused 3 to 4 percent of social welfare cases (depending on the particular social program) in the United States in 1992. Social welfare programs include income maintenance and related cash assistance programs, as well as foster care. It is estimated that more than $1.0 billion was spent administering welfare benefits for cases caused by alcohol and drug abuse problems. An additional $10.4 billion in transfer payments was made as a result of alcohol and drug abuse problems, sometimes to the alcohol and drug abusers themselves and sometimes to their families. The value of transfer payments does not represent a "net loss" to society and accordingly is not counted in the total cost.

Alcohol abuse has been implicated in about 18 percent of all motor vehicle crashes and nearly 40 percent of fatal crashes in the United States. This study estimates that the direct costs (mainly property destruction) of alcohol-related motor vehicle crashes were more than $13.6 billion in 1992 (costs of injuries and deaths were counted in previous chapters). This study also estimates that costs of about $1.6 billion were incurred as a result of alcohol-related fire destruction and fire containment.

Table 6.1

Other Effects of Alcohol and Drug Abuse on Society, 1992

(millions of dollars)

Cost	Total	Alcohol	Drugs
Value of Goods and Services			
Crime	$24,282	$6,312	$17,970
Social welfare	$1,020	$683	$337
Motor vehicle crashes	$13,619	$13,619	–
Fire destruction	$1,590	$1,590	–
Total, Direct Costs	***$40,511***	***$22,204***	***$18,307***
Lost Productivity			
Victims of crime	$3,071	$1,012	$2,059
Incarceration	$23,356	$5,447	$17,907
Crime careers	$19,198		$19,198
Total, Indirect Costs	***$45,625***	***$6,459***	***$39,164***
TOTAL	**$86,136**	**$28,663**	**$57,471**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding. Other costs resulting from alcohol- and drug-related crime, motor vehicle crashes, and fires (e.g., health care costs, premature death) are estimated and reported elsewhere in this report. Estimation of crime-related lost productivity attributed to alcohol and drug abuse is described in chapter 5, section 5.6.

6.2 Crime and the Criminal Justice System

6.2.1 Synopsis

The extremely strong links between alcohol or drug abuse and crime have long been the issues of public policy concern. This controversial issue has stimulated theory and research about what these links mean, with steady progress, although there is certainly not yet a consensus. This study estimates that illicit drug and alcohol abuse were responsible for $69.9 billion in economic costs in 1992—$57.1 billion for illicit drugs and $12.8 billion for alcohol abuse. These estimates are based on plausible estimates or assumptions of the causal relationships between illicit drugs and alcohol and various types of crime. The estimates of causal involvement attempt to find a midlevel between the extremes and, in so doing, to demonstrate the general magnitudes of the various types of impacts that alcohol and drug abuse-related crimes have on our Nation. The causal estimates used in this study are as follows:

- Drugs are responsible for about 25 to 30 percent of property crime and 4 to 5 percent of violent crime (the causal values are slightly different for the specific offenses within types).
- Alcohol is responsible for about 25 to 30 percent of violent crime and 3 to 4 percent of property crime (the causal values are slightly different for the specific offenses within classes).

- All "drug-defined" (e.g., dealing and possession) and "alcohol-defined" (e.g., driving under the influence and public drunkenness crimes) are so attributed.

Data (presented below) have been used to argue for much higher attribution rates. Alcohol and drugs are present in violent crimes and property crimes much more frequently than is reflected in the rates employed in this study. Conversely, there are also arguments for lower attribution rates. Some researchers have legitimate concerns that certain persons simply choose to engage in crime and to abuse alcohol and/or drugs, with no causal relationship between their crime and alcohol or drug abuse. This study—following the examples and methodologies of Cruze et al. (1981) and Rice et al. (1990) —uses causal estimates that straddle the extremes.

The estimates are directly comparable to the prior major studies in the types of costs that are included. This study includes the following:

- Cost of criminal justice system services;
- Losses by crime victims; and
- Opportunity costs of alcohol and drug abusers' foregone productivity in the legitimate economy because of either alcohol and drug abuse-related incarceration or engaging in "crime careers" (drug dealing and trafficking; income-generating predatory crime; and/or consensual crime, such as gambling and prostitution).

A current study (Miller et al. 1997b) is examining only the costs to victims, covering all of the elements of victim costs in these and prior alcohol and drug abuse cost studies. The study by Miller et al. (1997b) is using similar sources of data and estimation methods but is adding values reflecting "quality-of-life" impacts of crime using the willingness-to-pay methodology (discussed in chapters 3 and 5). Willingness-to-pay studies typically yield quality-of-life estimates that are an order of magnitude larger than the impacts valued using the human capital approach employed in this study.

This report reviews data from a broad range of data sources about drugs, alcohol, and crime, and it summarizes several current theories that attempt to explain the nature of the linkages between alcohol and psychoactive drugs and various types of crime. The data documenting the extent of the alcohol-crime and drug-crime linkages and theories about these linkages have advanced during the past 15 years. Still, no consensus has been attained, nor has the concern among some been dispelled that the alcohol and drug abuse-crime relationships may be entirely or largely spurious.

The rest of this section reviews data and trends on the nature, level, and effects of crime and alcohol or drug abuse and then directly addresses the data and theories about the relationship between alcohol or drug abuse and crime. This latter discussion is broken into reviews about alcohol and crime and drugs and crime, respectively. The concluding parts of this section develop and present estimates of values of the different types of economic effects that this study attributes to illicit drug and alcohol abuse. Estimation of crime-related lost productivity attributed to alcohol and drug abuse is described in chapter 5, section 5.6.

Table 6.2

Total Costs of Alcohol and Drug Abuse-Specific and Related Crime, 1992
(millions of dollars)

Cost	Total	Alcohol	Drug
Value of Goods and Services			
Criminal Justice System			
Police protection	$6,191	$1,547	$4,644
Legal and adjudication	$1,701	$491	$1,210
State and Federal correction	$8,483	$1,790	$6,693
Local correction	$3,517	$2,326	$1,191
Total, Criminal Justice System	*$19,892*	*$6,154*	*$13,738*
Federal Drug Traffic Control	*$3,753*	*$62*	*$3,691*
Total, Public Expenditures	***$23,645***	***$6,216***	***$17,429***
Private legal defense	$416	$68	$348
Economic costs to victims			
[Medical expenses for victims of violent crimes, counted elsewhere]	[$505]	[$400]	[$105]
Property damage	$221	$28	$193
Non-Government Expenditures	*$637*	*$96*	*$541*
SUBTOTAL, MEDICAL NOT INCLUDED[1]	**$24,282**	**$6,312**	**$17,970**
Lost Productivity (Earnings)[2]			
Victims of crime	$3,071	$1,012	$2,059
Incarceration	$23,356	$5,449	$17,907
Crime careers	$19,198	–	$19,198
SUBTOTAL	**$45,625**	**$6,461**	**$39,164**
TOTAL	**$69,907**	**$12,773**	**$57,134**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding. Other costs resulting from alcohol- and drug-related crime (e.g., health care costs, losses from homicides) are estimated and reported elsewhere in this report.

[1] Medical expenses from violent crimes are included in chapter 4 as a health consequence of alcohol and drug abuse.

[2] Estimation of crime-related lost productivity attributed to alcohol and drug abuse is described in chapter 5, section 5.6.

6.2.2 Trends in Crime and Alcohol and Drug Use

6.2.2.1 Crime

According to the National Crime Victimization Survey (U.S. Department of Justice 1993b), 33,649,000 criminal victimizations occurred in 1992 (based on a representative national sample). This figure suggests that one out of every six Americans ages 12 and older, was the victim of a crime. Of those criminal victimizations, 6,621,000, or almost 20 percent, were violent victimizations[1]—yielding a violent victimization rate of 32.1 per 1,000 persons ages 12 and older. In contrast to the estimated number of victimizations, in 1992 there were 14,438,191 criminal offenses reported to the police (U.S. Department of Justice 1994b).[2] This figure is lower than the figure reported by the National Criminal Victimization Survey because only a fraction of offenses experienced by victims and estimated from personal surveys are reported to the police. Because national news media reports exaggerate and sensationalize the extent of criminal activity in the United States, many Americans may perceive that the threat of crime has increased Yet, crime levels have remained stable or have declined modestly during the past 10 to 12 years, although this is more true for property crimes than for violent crimes (see figure 6.1). Of the more than 14 million offenses and arrests in 1993, larceny-theft and burglary were among the most often reported crimes. Table 6.3 disaggregates the number of known offenses, and table 6.4 disaggregates the number of known arrests.[3]

As a consequence of criminal victimization, victims experience personal injury, economic loss, and/or psychological trauma. In 1991, of violent crime victims who were injured, 51 percent received some level of medical treatment, and 10 percent incurred medical expenses. In the cases in which the dollar figure was known, medical expenses exceeded $250 in almost 60 percent of the victimizations (U.S. Department of Justice 1993c). In the same year, 72 percent of all personal victimizations and 92 percent of all household crimes resulted in economic losses. In 1991, approximately $19 billion was lost because of personal and household crime (see table 6.5).

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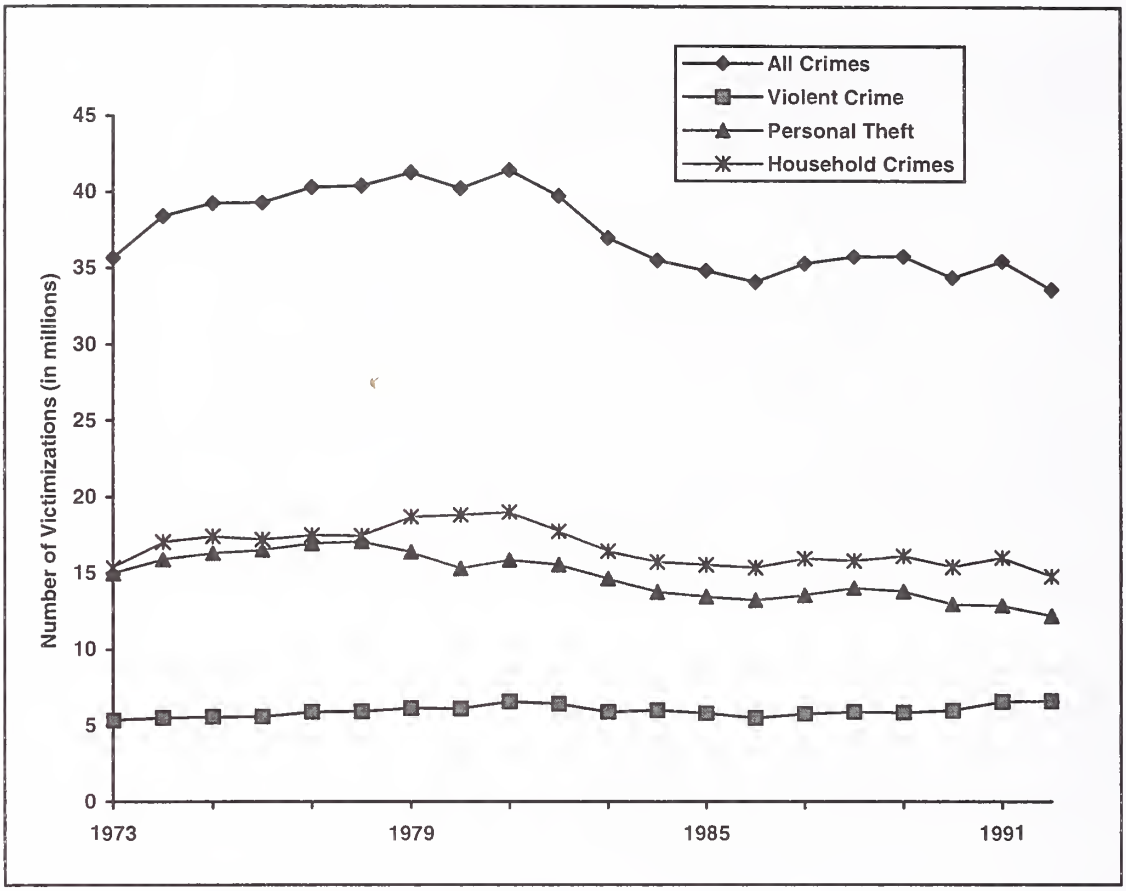
[1] The Bureau of Justice Statistics' National Crime Victimization Survey (NCVS) does not include information on homicide. Violent crimes include rape, robbery, and simple and aggravated assault. NCVS is a sample survey that provides information on the amount and nature of crime in the United States. Conducted by the Federal Government since 1973, it measures reported and unreported crime and collects detailed information on crime victims and the characteristics of the victimization.

[2] The Uniform Crime Reports (UCR) measure police workload and activity. This information is voluntarily reported to the Federal Bureau of Investigation. Unlike NCVS, UCR counts the number of murders and nonnegligent manslaughter—crimes that cannot be counted in a victimization survey.

[3] Ibid.

Figure 6.1

Victimization Levels for Selected Crimes: 1973–1992



SOURCE: U.S. Department of Justice (1994c), table 1.9.

Table 6.3

Number of Known Criminal Offenses, 1993

Type of Offense	Number of Known Offenses
Homicide	24,526
Assault (aggravated)	1,135,099
Robbery	659,757
Burglary	2,834,808
Larceny-theft	7,820,909
Auto theft	1,561,047
Rape	104,806

SOURCE: U.S. Department of Justice (1994b), table 30, p. 218.

Table 6.4

Number of Known Criminal Arrests, 1993

Type of Offense	Number of Known Arrests
Driving under influence	1,229,971
Liquor laws	419,082
Public drunkenness	604,979
Stolen property	134,864
Prostitution	88,850
Drug laws	968,606

SOURCE: U.S. Department of Justice (1994b), table 30, p. 218.

Table 6.5

Dollar Losses by Type of Crime, 1991
(millions of dollars)

Type of Crime	1991 Gross Dollar Loss
Personal crimes	**$4,569**
Crimes of violence	[$1,076]
Crimes of theft	[$3,493]
Household crimes	**$14,529**
ALL CRIMES	**$19,098**

SOURCE: U.S. Department of Justice (1993c), p. 16.

6.2.3 Relationship Between Alcohol and Drug Use and Crime

There exists a very strong empirical and conceptual association between criminal activity and the abuse of alcohol or illicit drugs, although there is little consensus about the nature of this relationship. Studies of arrestees and criminal justice populations consistently find high rates of alcohol and illicit drug use. Self-reported information from inmates confirms the strong association between drug use and crime. According to self-reports from a 1991 survey with a sample of 14,000 State and 6,600 Federal prison inmates, 24 percent of Federal inmates and 49 percent of State inmates reported that they were under the influence of alcohol or illicit drugs at the time of their current offense (U.S. Department of Justice 1994e). In State prisons, 32 percent of inmates reported they were under the influence of alcohol, and 31 percent reported they were under the influence of drugs (including 14 percent who were under the influence of both) when they committed their current offense.

Information obtained from arrestees provides additional evidence of the empirical association between drug use and crime. The Drug Use Forecasting (DUF) program operated by the National Institute of Justice conducts interviews and urinalyses in inner-city lockups of sampled male arrestees in 23 cities and selected female arrestees in 20 cities. Unfortunately, it is somewhat difficult to generalize DUF data because it is concentrated on inner-city arrestees. Still, DUF data from 1993 indicate that across the cities, the percentage of arrestees who tested positive for illicit drug use (any one of the following: opiates, cocaine, marijuana, amphetamines, LSD, or PCP) at the time of arrest ranged from 54 percent to 81 percent for male arrestees and from 42 percent to 83 percent for female arrestees (U.S. Department of Justice 1994d). Rates for males and females by type of crime are presented in table 6.6.

Table 6.6

Illicit Drug Use by Booked Arrestees in 24 Selected Cities, by Charge at Arrest, 1991

Charge	Males Testing Positive (%)	Females Testing Positive (%)
Homicide	48	65
Assault	48	50
Robbery	65	76
Burglary	68	63
Larceny-theft	64	58
Sex offense	37	68
Stolen property	58	74
Prostitution	47	85
Drug sale/possession	79	79

SOURCE: U.S. Department of Justice (1991a).

Despite, or perhaps because of, the strong association between drugs and alcohol and crime, social scientists, in an effort to develop better crime prevention strategies, have labored to develop and test theories that explain why and how this relationship exists. A useful beginning can be found in the basic observation that there are different types of crime. For example, violent crime is different from acquisitive or income-generating crime. Also, within violent crime, there are systemic factors involved that relate to the violent nature of the illegal drug trade (or to the illegal alcohol trade during Prohibition). A simplified framework for relating different types of crime to different effects of drugs has been proposed by Goldstein (1985).

The Goldstein system proposes a system of three models—psychopharmacological, economic, and systemic—which are hypothesized to represent the possible primary causal relationships between drugs and violence (these models can be generally extended to all types of crime). In his tripartite framework, Goldstein acknowledges that many factors probably combine to influence behavior. Moreover, as addressed in discussions of causality through this document, it is also very possible that underlying factors may contribute to a person both using alcohol and drugs and exhibiting criminal behaviors without there necessarily being a causal link between the two behaviors. Goldstein proposes that the psychopharmacological, economic, and systemic models can interact with all of the other factors, while still retaining their ability to explain criminal behaviors in relation to alcohol and drug use.

Psychopharmacological model. The psychopharmacological model suggests that "some individuals, as a result of short or long term ingestion of specific substances, may become excitable, irrational, and may exhibit violent behavior" (Goldstein 1985). The model hypothesizes that drugs may contribute to both violent behaviors and to the likelihood of a person becoming a victim of such behavior. This hypothesis also holds out the potential for some psychoactive substances to reduce violent behavior.

Economic model. The economic compulsive model suggests that "some drug users engage in economically oriented violent crime (e.g., robbery), in order to support costly drug use." Goldstein notes that heroin and cocaine, because of the "compulsive patterns of use" and relative costs associated with these drugs, are especially relevant to this model.

Systemic model. The systemic model suggests that "violence is intrinsic to involvement with any illicit drug." Goldstein defines systemic violence as "traditionally aggressive patterns of interaction within the system of drug distribution and use." For example, violence may be used to block competition, to punish drug dealers for selling poor-quality drugs, to collect unpaid debts, or to intimidate potential informants. According to this model, involvement in drug distribution could increase the likelihood of perpetrating or being victimized by violence.

This system does not so much propose new models or explanations for how abuse of alcohol and drugs might be related to types of crime as it recognizes or identifies groups or classes of theories. For example, the psychopharmacological model does not identify specific drugs or particular neurological systems or mechanisms by which behavior may be affected. It does, however, recognize the broader type of phenomenon that might be involved. The strength of the theory lies in suggesting the type of phenomena that other investigators ought to explore.

6.2.3.1 Alcohol

Extensive data are available that show a strong relationship between alcohol and crime—particularly violent crime. During the past two decades, research has discovered mechanisms and effects strongly suggesting that alcohol consumption plays a material, causal role in violent behaviors.

Using Goldstein's tripartite model, alcohol links well to the psychopharmacological model. Serotonin is a chemical by which nerve cells communicate with one another, and it regulates many chemical processes in the brain. Alcohol increases brain serotonin function temporarily, but thereafter, serotonin levels drop below normal levels (Pihl and Peterson 1993). This reduction in brain serotonin function is "associated with heightened vulnerability to depression, increased risk of violent suicide, propensity to exhibit aggressive or impulsive behavior, and susceptibility to alcohol abuse" (Pihl and Peterson 1993). These properties are strongly indicative of a causal link between alcohol abuse and violence, even though alcohol is only one factor among many that have been found to contribute to violence and aggressive behavior.

Numerous studies have found that "problem drinkers, alcohol abusers, and alcoholics appear to be over-represented among adults convicted of violent crimes, and people convicted of violent crime often report alcohol consumption immediately prior to their crime" (White et al. 1993).

Furthermore, research demonstrates that the degree of aggressive response is proportional to the amount of alcohol consumed (Taylor 1993). Empirical data on jail and prison inmates suggest that alcohol consumption also appears to be associated with violence. Inmates are more likely to have been under the influence of alcohol prior to a violent crime than for an economic crime or other types of crime, except for alcohol-defined offenses (see table 6.7). Still, other theories suggest that these patterns only represent association, not causation.

Table 6.7

Percentages of Inmates Who Used Alcohol and Other Drugs Prior to a Criminal Offense

	Jail Inmates (%) Committed Offense Under the Influence of:			*Prison Inmates (%)* Committed Offense Under the Influence of:		
Offense	**Alcohol Only**	**Drugs Only**	**Alcohol & Other Drugs**	**Alcohol Only**	**Drugs Only**	**Alcohol & Other Drugs**
Robbery	18	18	17	15	19	18
Assault	44	5	10	27	8	14
Property offenses	18	18	13	18	21	14
DWI	83	2	10	70	3	8
Drug offenses	7	29	12	8	26	10
Average for All Offenses	**29**	**15**	**12**	**18**	**17**	**14**

SOURCES: U.S. Department of Justice (1991b), table 3.3; (1993d), p. 26.

Conversely, alcohol does not fit within the economic compulsive model that Goldstein proposes. Alcohol is relatively inexpensive, and economic crimes, such as robbery or theft, would not be necessary for persons to acquire quantities of alcohol. Furthermore, alcohol is legal, easily accessible, and available (for people 21 and older) and thus does not fit the systemic component of Goldstein's model. (However, during Prohibition, alcohol was illegal, and violence was associated with its manufacture and distribution.)

6.2.3.2 Illicit Drug Use

The evidence regarding drug-induced pharmacological violence suggests that psychoactive drugs do not stimulate violent behavior in any systematic manner (U.S. Department of Justice 1994f). While abuse of certain drugs may be associated with violent behaviors, Goldstein notes that some drugs, such as heroin or tranquilizers, may have a "reverse psychopharmacological effect and ameliorate violent tendencies." In such instances, some individuals may be self-medicating by using these drugs.

Research provides strong evidence supporting the economic model of drugs and crime. Goldstein points out that "research indicates that most crimes committed by most drug users are nonviolent (e.g., shoplifting, prostitution, and drug selling)." Studies conducted in the 1960's and 1970's suggested that income-generating crime, such as property crime, was the most predominant narcotic drug-related crime (U.S. Department of Justice 1980). Later research confirmed this association and demonstrated, for example, that criminal activity among heroin addicts declined sharply during nonaddiction periods (Ball et al. 1981). Yet recent research suggests that these patterns may be changing and that more frequently, abusers of narcotics (including opiates, such as heroin) engage in drug distribution crimes (Nurco et al. 1991). The relationship between use of nonnarcotic drugs (such as cocaine or hallucinogens) and crime is unclear. However, several studies conclude that cocaine use has been strongly associated with virtually all types of crime, including drug distribution, theft, violence, and confidence games (Nurco et al. 1991).

Goldstein suggests that systemic violence is an essential factor in drug distribution, but other social and economic factors may also contribute to and account for the level of violent activity. Areas that experience higher levels of drug trafficking activity also lack social organization, have high rates of interpersonal violence, and are economically disadvantaged. Yet this association could be attributed to the presence of drug markets that are a precursor to or a result of the aforementioned social and economic factors contributing to the deterioration of that area (Collins 1990). Frequently, drug-related violent crimes, such as homicides and assaults, are linked to drug marketing activities (e.g., disputes among rival distributors or between buyers and sellers of drugs) (U.S. Department of Justice 1994f). For example, of the 347 drug-related homicides reported in New York City in 1984, 67 percent were in drug locations and were generally in areas where drugs were sold (U.S. Department of Justice 1992a).

Studies of criminal justice populations strongly suggest that alcohol and drug use are associated with different types of crime, but it is important to distinguish among the various types. Drawing on Goldstein's framework, these types of crime can include violent crime, economic crime, and systemic crime. The evidence suggests that dependence on an expensive drug generates economic motives that play a strong role in income-generating criminal activity. Although the relationship between illicit drug use and violence is very poorly understood, it can be stated with some certainty that some systemic violence is associated with the drug trade.

6.2.3.3 Percent of Crime Attributed to Alcohol and Drug Abuse

The brief review of data and theory about the relationship of drugs and alcohol to crime suggests several conclusions. First, both theory and evidence support attribution of a material proportion of income-generating property crimes to drug abuse. The same assertion can be made about the involvement of alcohol with violent crimes. Whereas there is substantial evidence linking drugs with violent crime and alcohol with property crime, the theoretical and evidentiary foundations for developing quantitative estimates of these relationships are not strong. Consequently, as for the prior major cost studies on alcohol and drug abuse, the objective has been to select plausible attribution factors.

The attribution factors used in this study for the drugs and crime relationship are based on interviews with inmates in prisons and jails. For the alcohol and crime relationship, this study has adopted the general approach of Cruze et al. (1981), which attributes about one-half of the violent crimes in which the perpetrator had been drinking alcohol and one-tenth of the property crimes. Drug-defined crimes (e.g., dealing, trafficking, and possession) and alcohol-defined crimes (e.g., driving under the influence, public drunkenness, and liquor law violations) are attributed at 100 percent.

The rationale for using the Cruze et al. approach to develop attribution factors has primarily been one of default. There have been more data collected about the involvement of alcohol and drugs in crime (studies of association) since 1981. Recent studies theorize about causality, but there is an absence of empirical studies suggesting major changes in causality factors. The interested reader should see recent major reviews prepared for the National Institute on Alcohol Abuse and Alcoholism (*Alcohol Health & Research World* 17(2), 1993; Martin 1993; and the U.S. Department of Justice 1992a) that have reexamined the data on these issues. This study elects to make use of the new data on association but to retain the prior approach to translating those data into attribution factors.

Alcohol and drug abuse attribution factors used in this study are presented in table 6.8. About 30 percent of inmates incarcerated for robbery, burglary, and larceny indicated that they committed the crime for which they were incarcerated in order to get money for drugs. About 2 to 5 percent of those incarcerated for violent offenses made the same attribution. However, the new attribution factor of 15.8 percent for drugs and homicide has been drawn from detailed data about the nature of murder circumstances and the relationship of offenders and victims compiled by the U.S. Federal Bureau of Investigation (U.S. Department of Justice 1994b). Homicides in which drugs are explicitly listed as a factor, plus "juvenile gang" and "gangland" killings, represented 15.8 percent of homicides for which circumstances could be identified. This rate is applied to all homicides, although the rate may be too low because it is likely that a higher proportion of homicides with unknown circumstances may have also involved drug dealing and trafficking.

The drug attribution factors are somewhat, but not significantly, different from the estimates that have been used since Cruze et al. (1981). Those estimates made no attribution for drug-related violence (although a factor was included in Harwood et al. 1984). The factors for predatory and consensual crimes were also drawn from self-reported drug use by prison inmates. It was assumed that all daily heroin users were drug motivated and that 20 percent of daily users of other drugs were so motivated.

Alcohol attribution factors are very similar to those developed by Cruze et al. (1981). The methodology used is the same; however, current data have been obtained from the 1991 Survey of Prison Inmates (U.S. Department of Justice 1994e) to replace data originally obtained from the 1974 survey. Again, the approach is to attribute to alcohol about 50 percent of violent crimes where the perpetrator had been drinking (a total of about 30 percent of homicides and assaults and 22.5 percent of sexual assaults). One-tenth of property crimes where the perpetrator had been drinking are attributed, which is about 3 to 4 percent of all such crimes. In table 6.8, it can be observed that alcohol attribution factors—based on prisoner-reported rates of alcohol use by perpetrators—have fallen somewhat from the early 1970's. The factor for robbery fell from 3.9 to 3.4 percent (meaning that 39 percent of robbery inmates were drinking at the time of their crime in the early 1970's, compared with 34 percent of inmates in 1991). Somewhat greater decreases in rates—by about one-fourth—occurred for burglary, larceny, and auto theft between the early 1970's and 1991. Again, the alcohol causal factors for these crimes presented in table 6.8 are only 10 percent of the proportion of perpetrators reported under the influence of alcohol at the time of their arrest.

Note that the same causal factors that are applied to costs of offenders are applied to costs of victims. This may introduce an unknown direction and amount of bias. In the absence of data to the contrary, estimates reported in this study reflect the assumption that offenders in alcohol- and drug-related crimes are neither more nor less likely to be apprehended, prosecuted, convicted, and incarcerated (or put on probation) than are offenders in crimes that are unrelated to alcohol or drugs.

6.2.4 Criminal Justice System and Victim Costs Attributed to Alcohol and Drug Abuse (Excluding Health- and Productivity-Related Costs)

The estimated economic costs of crime attributable to drug abuse in 1992 were $18.4 billion (see table 6.9). The costs attributable to alcohol abuse were $6.4 billion. There are a number of different dimensions to these costs, all of which have been discussed in prior studies (e.g., Cruze et al. 1981; Harwood et al. 1984; Rice et al. 1990). The specific methodologies by which these costs have been calculated were detailed in those studies and therefore are not summarized in detail in this report. However, the detailed data and tables used for all the calculations appear in appendix C, tables C.1 to C.8, and these are also directly comparable to tabulations in the prior studies.

The costs of crime caused by alcohol and drug abuse that are discussed in this section include public and private expenditures for criminal justice services and protection and economic costs to victims not including the value of assets transferred from victims to perpetrators. These costs are summarized in table 6.9 and discussed in the text that follows. Tables detailing data, methodology, and sources of data used to compute each cost category follow this discussion.

Criminal justice system costs include expenditures for police protection; legal and judicial services; and Federal, State, and local correctional institutions. Expenses for police protection equal $6.2 billion ($4.6 billion for drugs and $1.5 billion for alcohol), representing almost one-third of the total alcohol and drug criminal justice expenses. Legal and adjudication costs were $1.7 billion; State and Federal correction costs were $8.5 billion; and local correction costs were $3.5 billion. In all categories except local corrections, the majority of the costs were due to drug abuse—local corrections deals extensively with driving under the influence and alcohol-related public disorder cases.

Table 6.8

Causal Factors for Alcohol and Drug Relationship to Crime: Comparison of Factors in Current and Prior Studies
(percent of crimes attributed, by type of crime)

	Alcohol Factors		Drug Factors	
Type of Crime	**Current Study**	**Prior Studies**	**Current Study**	**Prior Studies**
Homicide	30.0	30.0	15.8	10.0
Aggravated assault	30.0	30.0	2.4	10.0
Sexual assault	22.5	22.5	5.1	10.0
Other assaults	30.0	0.0	5.1	0.0
Robbery	3.4	3.9	27.2	26.8
Burglary	3.6	4.7	30.0	22.4
Larceny-theft	2.8	3.8	29.6	18.6
Auto theft	3.5	4.6	6.8	18.6
Driving under the influence	100.0	100.0	0.0	0.0
Liquor laws	100.0	100.0	0.0	0.0
Public drunkenness	100.0	100.0	0.0	0.0
Stolen property	0.0	0.0	15.1	18.6
Prostitution	0.0	0.0	12.8	12.8
Drug laws	0.0	0.0	100.0	100.0

SOURCE: Analysis by The Lewin Group.

NOTE: "Prior studies" refers to identical factors used in Cruze et al. (1981); Harwood et al. (1984); and Rice et al. (1990).

Table 6.9

Total Public and Private Costs of Alcohol and Drug Abuse-Specific and Related Crime, 1992
(millions of dollars)

Cost	Total	Alcohol	Drug
Criminal Justice System			
Police protection	$6,191	$1,547	$4,644
Legal and adjudication	1,701	$491	$1,210
	$8,483	$1,790	$6,693
Local correction	$3,517	$2,326	$1,191
Total, Criminal Justice System	*$19,892*	*$6,154*	*$13,738*
Federal Drug Traffic Control	*$3,753*	*$62*	*$3,691*
Public Expenditures	***$23,645***	***$6,216***	***$17,429***
Private Legal Defense	*$416*	*$68*	*$348*
Economic costs to victims [Medical expenses for victims of violent crimes, counted elsewhere]	[$505]	[$400]	[$105]
Property Damage	*$221*	*$28*	*$193*
TOTAL ***(Medical not included)***[1]	**$24,282**	**$6,312**	**$17,970**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

[1] Medical expenses from violent crimes are included in chapter 4 as a health consequence of alcohol and drug abuse.

Actual Federal drug control expenditures for 1993 were $3.7 billion (excluding costs for the criminal justice system and drug treatment programs) (Office of National Drug Control Policy 1994). Drug law enforcement and control of drug traffic involve numerous Federal agencies. In addition to the Drug Enforcement Administration within the Department of Justice, Federal funds for drug control are distributed among agencies within the Departments of Agriculture, Defense, Education, Health and Human Services, Interior, Labor, State, Transportation, and Treasury. An additional $62 million was spent on alcohol control and licensing by the Bureau of Alcohol, Tobacco, and Firearms.

Private legal defense services for those accused of crimes that are attributable to drug and alcohol abuse were $416 million. The total annual revenue for legal services for 1992 was $108.4 billion (U.S. Bureau of the Census 1994). However, only about 2.6 percent of lawyers practice criminal law (this percentage of members of the American Bar Association belong to the criminal law section). This was allocated to alcohol and drug abuse (and nonalcohol and nondrug offenses) in proportion to the total of police protection services.

Victims of crime often incur medical expenses and/or damaged property. In 1992, medical services cost an estimated $400 million for injuries resulting from alcohol-related crime and $105 million from drug-related crime. These values, which represent health care costs, are included in chapter 4. Drug-related crimes cost about $193 million in property damage; alcohol-related crimes cost about $28 million in property damage.

6.3 Social Welfare Costs

6.3.1 Synopsis

Conservatively, 3.3 percent of persons involved in the social welfare system in 1992 received services because of problems, impairments, or difficulties resulting from their abuse of alcohol or other drugs. That is, this proportion of cases had eligibility because of a direct administrative determination involving alcohol or drug diagnoses. Recent welfare reforms are largely terminating eligibility due to alcohol or drug dependence per se. Social welfare beneficiaries only had modestly higher rates of alcohol or drug use and diagnoses than the general population. Accordingly, the amount of total social welfare costs (benefits plus administrative costs) attributable to alcohol and drug abuse was 3.3 percent of the $347 billion in annual expenditures, or $11.4 billion in 1992 (see table 6.10). Of these total expenditures, the value of benefits is $10.4 billion, or more than 90 percent, while administrative costs account for $1.02 billion, or a little more than 9 percent of the total. Of the $11.4 billion spent on social welfare that is attributable to alcohol and drug abuse, it is estimated that 67 percent of costs are related to alcohol abuse and 33 percent to drug abuse ($7.6 billion and $3.8 billion, respectively). However, because cash transfer programs do not represent a cost to society per se, but rather a redistribution of resources, only the administrative expense is included in these estimates. Accordingly, $683 million in social welfare administration/service costs are attributed to alcohol abuse, and $337 million in costs are attributed to drug abuse. Applicant and beneficiary costs to establish eligibility have not been estimated; data are not available to estimate such expenses.

6.3.2 The U.S. Social Welfare System

Social welfare spending is large, relative to the United States' net national product (NNP). This spending was equal to about 20 percent of the NNP in 1991, or $1.17 trillion (U.S. Bureau of the Census 1994). This section of the study focuses on those types of social welfare that assist persons unable to work because of disability; the low-income population eligible for cash or cash equivalent assistance; and direct human services, such as child welfare services, Head Start, special education, and vocational rehabilitation. Programs in these categories had expenditures of $347 billion in 1992.

For the social welfare programs included in this study, appendix table D.1 shows the number of persons enrolled in each program, total expenditures for each program, and the proportion of total costs that are transfer payments versus those that are administrative expenses. Approximately 90 percent of program expenses are transfer payments in the form of either cash or noncash aid.

Administrative and direct service expenses, which account for around 9 percent of total social welfare expenditures, do imply a net loss of resources to society.

6.3.3 Methodology

The fundamental hypothesis of this analysis is that persons with severe alcohol and other drug problems may have reduced earnings or may become disabled and thereby become eligible for social welfare programs. Addiction to alcohol or other drugs can affect the likelihood of gainful employment, and it can increase the chance that persons may qualify and utilize one or more income-eligible programs. In addition to causing welfare eligibility, alcohol and drug abuse may be factors that contribute to "welfare dependency"—that is, alcohol and drug abuse may be barriers for some people to getting off welfare.

Insofar as alcohol or drug use may be the cause for receiving social welfare services, this study's estimates of the proportion of alcohol and drug users who qualify for services is derived from data currently available from Federal programs in 1992. Some Federal and State social welfare programs designated alcohol or drug abuse as a disability, provided a person met certain clinical standards for addiction. Therefore, a percentage of social welfare recipients are considered disabled

Table 6.10

Alcohol and Drug Abuse-Related Social Welfare Expenditures, 1992
(millions of dollars)

				DIRECT HUMAN SERVICES	
	TOTAL	SOCIAL INSURANCE: OASDI,[1] SSI[2]	PUBLIC AID: AFDC,[3] FOOD STAMPS	**Child Welfare, Foster Care, Adoption Svcs.**	**Head Start, Voc. Rehab., Special Ed.**
Total Expenditures	**$346,550**	**$126,190**	**$179,370**	**$2,700**	**$6,990**
Proportion alcohol and drug abuse attributed	3.3%	1.7%	4.1%	3.3%	3.3%
Alcohol and drug abuse-related expenditures	$11,403	$2,206	$8,856	$111	$231
Total transfer costs due to alcohol and drug abuse	$10,383	$2,077	$8,244	$63	$0
Administrative and direct service costs due to alcohol and drug abuse	**$1,020**	**$130**	**$612**	**$48**	**$231**

SOURCE: Analysis by The Lewin Group.

[1] OASDI = Old Age, Survivors, and Disability Insurance.

[2] SSI = Supplemental Security Income.

[3] AFDC = Aid to Families with Dependent Children.

NOTE: Components may not sum to totals because of rounding. Of total costs for transfer, administrative, and total expenditures, 67 percent is attributed to alcohol and 33 percent is attributed to drug abuse.

because of alcohol or drug problems. The cost estimates reported in this study are derived from analysis of the following:

- Relevant social welfare programs and their total expenditures;
- The proportion of expenditures devoted to direct benefits, transfer payments, and administrative costs; and
- The estimated proportion of social welfare recipients that receive services because of their abuse of alcohol or drugs.

This study organized social welfare programs into three categories: social insurance, public aid, and direct human services. Social insurance programs provide protection against wage loss resulting from retirement, prolonged disability, death, or unemployment. Disability benefits are payable to an insured worker under age 65 with a prolonged disability and to the disabled worker's dependents on the same basis as dependents of retired workers.

Public aid includes both cash and noncash benefit programs. Public aid cash benefits include State-administered public assistance programs, emergency and general assistance, and the Federal Supplemental Security Income (SSI) program. These programs provide assistance to persons based on income eligibility. These benefits include public transfers (food stamps, school lunch, and public housing) and employer- or union-provided benefits to employees.

The third type of social welfare program reviewed here is direct human services, such as child welfare, Head Start, vocational rehabilitation, and special education. Direct human service programs provide services to individuals, and with the exception of maintenance payments for foster care and adoption assistance, expenditures for these programs consist of the costs of providing services.

6.3.4 Alcohol and Drug Abuse and Social Welfare: Prevalence and Costs

Two types of data are generally available concerning the extent of alcohol and drug abuse found among social welfare beneficiaries: (1) data on prevalence of alcohol and drug abuse among beneficiaries and (2) administrative data on cases where alcohol and drug abuse were conditions for eligibility. Unfortunately, there are substantial variations in how alcohol and drug abuse and/or dependence are defined in different prevalence studies and in different program eligibility criteria.

It is important to review the various types of studies because in the public debate over this issue the data are often used almost interchangeably. Prevalence studies are often used in such a manner as to imply that one-third or even more of those who receive social welfare benefits do so because of alcohol or drug problems. Administrative data reveal that most of the social welfare beneficiaries with alcohol and drug abuse problems actually are eligible because of another problem not necessarily related to abuse of alcohol and/or drugs.

6.3.4.1 Prevalence Studies

Several recent studies have estimated the prevalence of alcohol and other drug abuse in various social welfare programs. Since few social welfare programs determine eligibility based on an assessment for alcohol and drug problems, these recent studies focus on the prevalence of alcohol and drug use and frequently use the National Household Survey on Drug Abuse (NHSDA) as the primary data source to calculate their estimates.[4]

Different prevalence studies have applied different criteria for determining use and abuse of alcohol and drugs. Most of the studies have applied some criteria to ascertain alcohol abuse or dependence, but the criteria have varied from study to study. Few studies have applied criteria to determine drug abuse or addiction; instead, they have reported past-month and past-year drug use.

The Center on Addiction and Substance Abuse (CASA) performed a study that focused on alcohol abuse, drug abuse, and women on welfare. CASA estimated that 28 percent of Aid to Families with Dependent Children (AFDC) recipients are addicted to or abuse drugs or alcohol (CASA 1994). However, this study did not apply criteria for determining either abuse or dependence and appears to have overestimated the magnitude of the problem. CASA used NHSDA data.

Two studies conducted by the Assistant Secretary for Planning and Evaluation (ASPE) and the National Institute on Drug Abuse (NIDA) analyzed patterns of alcohol and drug use among persons enrolled in AFDC and food stamps, the first of which (U.S. Department of Health and Human Services [DHHS] 1994b) did not differentiate levels of impairment. The 1994 study estimated that 8.7 percent of persons receiving AFDC benefits and 10.4 percent of persons enrolled in the food stamps program had three or more episodes of binge drinking per month and that 10 percent had used an illicit drug in the last month. Table 6.11 summarizes findings for persons receiving AFDC and food stamps.

The second study by ASPE and NIDA (DHHS 1994b) analyzed the extent of use and impairment relating to that use. ASPE and NIDA found that 5.2 percent of persons in the AFDC population had a “significant” impairment resulting from alcohol and drug abuse, compared with 2.6 percent in the non-AFDC population. Table 6.12 summarizes the results of the study.

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[4] The National Household Survey on Drug Abuse (NHSDA) is a series of national cross-sectional probability surveys designed to obtain accurate data on levels and patterns of drug and alcohol use and abuse. The NHSDA’s universe is the general U.S. household population age 12 and older.

Table 6.11

Alcohol and Drug Use in AFDC and Food Stamp Households

	AFDC	Food Stamps
Alcohol		
Three or more binge-drinking episodes per month, (a binge is drinking five or more drinks in a row)	8.7	10.4
Marijuana		
Past year	16.7	15.1
Past month	8.7	7.8
Weekly for past year	5.4	5.2
Daily or almost daily for past year	3.1	2.9
Cocaine		
Past year	6.4	6.4
Past month	1.6	2.1
Weekly for past year	1.0	1.3
Psychotherapeutic drugs		
Past year	7.2	6.9
Past month	2.9	2.5
Any illicit drug use		
Past year	21.6	19.5
Past month	10.5	10.1

SOURCE: U.S. Department of Health and Human Services (1994a).

Table 6.12

Level of Alcohol and Drug Impairment in AFDC and Non-AFDC Populations

Impairment Category	AFDC (%)	Non-AFDC (%)
No impairment	63.0	62.8
Little impairment	20.7	25.6
Some impairment	11.2	9.0
Significant impairment	5.2	2.6

SOURCE: U.S. Department of Health and Human Services (1994b).

Table 6.13

Prevalence of Alcohol and Drug Use in the Welfare System and the General Population in a Northern California County

Category	Percent of Welfare Recipients	Percent of General Population
Problem drinker	24	11
Illicit drug user, past year	58	27
Multiple drug user, past year	21	1

SOURCE: Weisner and Schmidt (1993).

A study by Weisner and Schmidt (1993) analyzed alcohol- and drug-related problems among health and social services agency populations, including welfare recipients, in a northern California county. The study found that welfare recipients were 2.2 times more likely to be problem drinkers, 2.1 times more likely to be illicit drug users, and 12.0 times more likely to be multiple-drug users than were members of the general population. Results of the study are summarized in table 6.13.

The prevalence studies reviewed in this section demonstrate that there are a number of different estimates that can be—and have been—seized upon in the debates over the roles of alcohol and drug abuse in social welfare spending. The data support the conclusion that the rates of alcohol and drug abuse are materially higher among the population of social welfare program beneficiaries; however, the data also demonstrate how much the nature and extent of the problem can be misjudged if meaningful criteria are not applied to the determination of estimates. The following section presents more authoritative data about the frequency with which an alcohol or drug abuse problem actually is the basis for receipt of social welfare benefits.

A recent study of this issue found that rates of alcohol and drug problems among social welfare beneficiaries were actually quite similar to rates for the general population. Grant and Dawson (1996) analyzed the 1992 National Longitudinal Alcohol Epidemiologic Survey (NLAES) and applied DSM–IV clinical criteria. This is arguably the most rigorous assessment done to date, based on rigorous diagnostic criteria.

6.3.4.2 Administrative Data on Alcohol and Drug Abuse in Welfare Programs

Two recent studies have estimated the proportion of persons receiving disability benefits because of an explicitly diagnosed and recorded alcohol or other drug problem. The first was a 1994 report conducted by the U.S. General Accounting Office (GAO) on disability benefits that examined the number of alcohol and drug addicts receiving disability benefits in two social welfare programs: Disability Insurance (DI) and Supplemental Security Income (SSI).[5] The report estimated an annual cost of $1.4 billion for individuals with alcohol and/or drug addictions, including both benefit payments and administrative costs (GAO 1994). Addiction is one of many conditions that determine eligibility for both of these programs. Persons qualifying with addiction as either a primary or secondary diagnosis have increased to 250,000 persons in 1994, up from 100,000 in 1989. However, recent welfare reforms are terminating alcohol and/or drug dependence as a basis of eligibility for many Federal and State social welfare programs.

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[5] Effective 1996, alcoholism and drug addiction were no longer eligible disabilities for receipt of SSI or DI. Individuals with other qualifying disabilities in addition to alcoholism and drug addiction can still be determined eligible.

The DI program determines eligibility for benefits using clinical criteria and medical evidence, such as symptoms and laboratory test results. To qualify for benefits, recipients must have physical or mental impairments expected to last a minimum of 12 months or result in death. Alcohol or drug addiction could be the primary criterion for eligibility (which was terminated effective March 1996), or it could be a secondary reason. In cases where addiction is a secondary diagnosis, the recipients must have a primary problem sufficient to justify benefits, whether or not they have a secondary addiction diagnosis.

The GAO report analyzed Social Security Administration data bases and found that although nearly 100,000 recipients of DI had a determination of alcohol and/or drug addiction in 1993, only 26,000 cases were primary diagnoses, and the rest were secondary diagnoses (where eligibility was primarily determined based on another disabling condition). The study did not distinguish between alcohol and other drug addiction.

The study also analyzed participation of persons addicted to alcohol and other drugs in the SSI program. SSI provides income support to indigent persons 65 and older, blind or disabled adults, and blind or disabled children. Eligibility for SSI on the basis of alcohol or drug addiction is fundamentally the same as it is for DI (and has likewise been terminated). Analysis of the SSI program showed that at the end of 1993, more than 150,000 SSI recipients (4.8 percent of the adult SSI population) had a primary or secondary diagnosis of alcohol or drug addiction. About 90,000, or 60 percent, had a primary alcohol or drug addiction diagnosis, but the rest were eligible because of another primary diagnosis (GAO 1994). Table 6.14 summarizes data on alcohol and drug abuse in the DI and SSI programs.

Table 6.14

Addiction Cases in SSI and DI Programs, 1993

	Disability Insurance	**Supplemental Security Income**
Drug Addiction and Alcoholism program	NA	69,419
Primary diagnosis	26,065	21,268
Secondary diagnosis	71,708	60,739
TOTAL	**97,773**	**151,426**

SOURCE: U.S. General Accounting Office (1994).

A 1994 report from the Office of the Inspector General of the Department of Health and Human Services (DHHS) also analyzed the proportion of SSI recipients who qualified because of alcohol and/or other drug problems. This study only looked at recipients in the Drug Addiction and Alcoholism (DA&A) program, in which treatment is mandated as a condition for receiving benefits. The Inspector General reported that 80 percent of alcoholics and drug addicts continued to receive SSI payments 3 years after qualifying for the program despite treatment mandates. The study did estimate that 84 percent of the addiction population was alcoholic or both alcohol and drug addicted (DHHS 1994d). The results are summarized in table 6.15.

The results from the various studies reviewed above are summarized in appendix D.

Table 6.15

Cases of Alcohol and Drug Dependence in SSI, February 1994

Diagnostic Group	1994 Recipients	
	No.	**%**
Alcohol dependence	31,704	39
Drug dependence	15,150	19
Other (alcohol/drug abuse)	14,644	18
Unknown data	18,834	24
TOTAL	**80,332**	**100**

SOURCE: U.S. Department of Health and Human Services (1994d).

6.3.4.3 Analysis

There is a difference between alcohol and drug use that *causes* a person to become eligible for a social welfare program(s) and alcohol and drug use that *occurs* during receipt of benefits but is not severe enough to be considered the primary cause for eligibility. Two important conclusions are drawn from the preceding review of prior research:

- About 3.3 percent of welfare recipients in 1992 had alcohol and drug abuse problems severe enough to establish eligibility for selected welfare programs.

- About 67 percent of the alcohol and drug abuse-related welfare cases appear to be attributable to alcohol and about 33 percent to drug abuse (with overlap in the two groups).

The estimates selected to calculate persons in social welfare programs whose alcohol and/or drug use have qualified them for services are based on data obtained from programs or studies that apply rigorous criteria for assessing whether alcohol and drug abuse is a significant reason for qualifying or receiving social welfare benefits. The review of the literature determined that four programs employ clinical definitions and have data from which to make estimates. Estimates for other social welfare programs are developed by applying the values for the four "data rich" programs:

- Disability Insurance (DI),
- Supplemental Security Income (SSI),
- Aid to Families with Dependent Children (AFDC), and
- Food stamps.

This paper modified the estimates of alcohol- and drug-related impairment for SSI and DI (which were both about 5 percent). For SSI, the number of alcoholics and drug addicts reported in the GAO study included persons in the Drug Addiction and Alcoholism program and all primary and secondary diagnoses; similarly, the number of alcohol and drug abusers in the DI program included all primary and secondary diagnoses. This study assumes that only one-half of the cases with a secondary alcohol and drug abuse diagnosis are attributable. Although all the secondary diagnoses could be dropped, it is plausible that the alcohol or drug abuse problems may have caused the primary nonalcohol and drug diagnosis. However, no data were available to test this assumption.

The results were estimates that 3.1 percent of SSI and 1.7 percent of DI cases were attributable to alcohol and drug abuse. The ASPE study's estimate of 5.2 percent of persons enrolled in AFDC because of "significant" impairment due to alcohol or drug abuse was adopted and was also applied to the food stamps program.

This paper then applied these estimates to social welfare programs for which no alcohol and drug abuse-related data existed. These estimates were applied within the three typology areas discussed earlier. For example, the estimate for persons enrolled in DI was 1.7 percent, and because DI is a social insurance program, the 1.7 percent estimate was applied to the other social insurance programs. Similarly, SSI and AFDC are public aid programs, so the simple average of 3.1 percent and 5.2 percent was applied to other public cash and noncash aid programs. Finally, the 3.3 percent average of DI, SSI, and AFDC was applied to all programs under direct human services. Detailed calculations by social welfare program appear in appendix table D.3, and summary calculations are presented in table 6.16. The estimates for transfer payments and administrative expenses are also presented in table 6.16.

Estimates of the proportion of cases related to alcohol and drug problems, respectively, were derived using SSI data. Those records indicated that for persons who qualified for SSI with alcohol and drug abuse as the primary diagnosis, 67 percent had a primary dependence on alcohol and 33 percent were primarily drug addicts.

Applying the above rates to social welfare spending for the programs reviewed in this study yields an estimate of the cost of services (i.e., benefits plus administrative costs) provided to people with alcohol and drug problems of about $11.4 billion in 1992. Of this total, $10.4 billion are transfer payments, which reallocate resources from one segment of society to another. Administrative and direct service expenses accounted for $1.02 billion, and these costs represent a net loss of resources to society. Two-thirds of the total expenditures—$7.6 billion—is attributable to alcohol, and $3.8

billion is attributable to illicit drug abuse. These estimates may be conservative and may underestimate the true extent to which alcohol and drug abuse problems contribute to receipt of social welfare services. This paper's estimates are based on analyses that applied clinical criteria (dependence or abuse) or clinical-like criteria (significant impairment) for determining alcohol and drug abuse-related program eligibility. The estimates are, therefore, much lower than the prevalence estimates summarized in this report and somewhat lower than the number of reported cases in the DI and SSI programs.

6.3.5 Conclusion

Alcohol and drug abuse impose significant costs to the social welfare system. This study conservatively estimates that more than 3.3 percent of current social welfare cases are attributable to alcohol or drug abuse. This number is directly tied to cases for which there is a direct administrative finding of eligibility due to disability or impairment from alcohol or drug disorders. It is possible that the actual number of persons whose alcohol or drug abuse problems led to participation in the social welfare system may indeed be much higher, because both alcohol and drug use prevalence rates are somewhat higher than this estimate (in the range of 5 or even 10 percent). Determining the level at which alcohol and drug abuse impair or prevent persons from working and lead to receipt of welfare benefits is an important policy issue, and this study represents an attempt to analyze available data and construct reasonable criteria for this issue.

The economic burden of alcohol and drug use that is borne by the social welfare system is significant as well. Alcohol and drug abuse-related social welfare costs were about $11.4 billion in 1992, of which $10.4 billion was passed on as transfer payments, and $1.02 billion was an administrative expense. Transfer payments do not represent a net loss to society, but rather a redirecting of resources, and accordingly are not included in these estimates of other impacts of alcohol and drug abuse. Administrative costs, however, are included here. This study estimates that about $683 million was attributable to alcohol abuse, and about $337 million was attributable to drug abuse.

Beneficiaries also bear costs in applying for and obtaining program benefits. It is possible that these costs may be comparable in size to program administrative costs, because a great deal of time can be required to make application and document eligibility for social assistance programs. These costs have not been included because of a lack of suitable data.

Alcohol and drug abuse in the social welfare system represent significant policy concerns. This review of the literature found several studies that estimated that welfare recipients were about twice as likely as members of the general population to have a serious alcohol or drug abuse problem. Another area of concern is that welfare recipients who are drug abusers are more likely to remain in a program for longer periods of time.

Table 6.16

Alcohol and Drug Abuse-Related Social Welfare Expenditures, 1992

(millions of dollars)

	TOTAL	SOCIAL Insurance: OASDI, SSI	PUBLIC AID: AFDC, Food Stamps	DIRECT HUMAN SERVICES	
				Child Welfare, Foster Care, Adoption Svcs.	**Head Start, Voc. Rehab., Special Ed.**
Total expenditures	$346,550	$126,190	$179,370	$2,700	$6,990
Proportion of alcohol and drug abuse-caused	3.3%	1.7%	4.1%	3.3%	3.3%
Total alcohol and drug abuse-caused welfare expenditures	**$11,403**	**$2,206**	**$8,856**	**$111**	**$231**
Transfer costs as percent of total	91.7%	94.3%	93.6%	56.5%	0%
Alcohol costs	$6,963	$1,388	$5,533	$42	$0
Drugs costs	$3,420	$689	$2,711	$21	$0
Subtotal, transfer costs	***$10,383***	***$2,077***	***$8,244***	***$63***	***$0***
Administrative/service costs as percent of total	8.3%	5.7%	6.4%	43.5%	100%
Alcohol costs	$683	$84	$378	$32	$155
Drugs costs	$337	$41	$186	$16	$76
Total, Administrative and Direct Service Costs	**$1,020**	**$130**	**$612**	**$48**	**$231**

NOTE: Components may not sum to totals because of rounding. Of total costs for transfer, administrative, and total expenditures, 67 percent are attributed to alcohol and 33 percent are attributed to drug abuse.

6.4 Motor Vehicle Crashes

A significant amount of research and literature indicates that alcohol is a causal factor in motor vehicle crashes. Most of the calculations in this section are based on the Blincoe and Faigin study (1992), which is the most recent comprehensive analysis of motor vehicle crashes and the most recent data on alcohol involvement in crashes. Verbal inquiries were made with the National Highway Traffic Safety Administration (NHTSA), and Traffic Safety Facts 1993 were reviewed regarding data on drug involvement in motor vehicle crashes.

Although it is hypothesized that drug abuse may be a causal factor in motor vehicle crashes, reliable data with which to estimate the value of this cost element still do not exist. Little is known about the role of other drugs of abuse in fatal motor vehicle crashes and the effect of driver impairment from drugs in nonfatal crashes. Orsay et al. (1994) conducted a hospital-based study of injured motorists in the Chicago metropolitan area that linked police reports and hospital data and evaluated the role of other drugs in addition to alcohol in nonfatal, serious motor vehicle crashes. Similar to recent results reported from a Tennessee study (Kirby et al. 1992), this study revealed that other drugs in addition to alcohol are often present in the seriously injured motorist population. These two very limited studies begin to make the case for more intensive study of the involvement of drugs in motor vehicle crashes; however, they do not as yet constitute a sufficient basis for developing cost estimates. Consequently, we include this cost element only for alcohol abuse and have excluded drug abuse costs from this study.

Strong data are available concerning the involvement of alcohol in motor vehicle crashes. Information on the number of fatalities, property damage only, accidents, and number of injuries was obtained from data published by the NHTSA from the Fatal Accident Reporting System (FARS), the National Accident Sampling System (NASS), the Crashworthiness Data System (CDS), and the General Estimates System (GES). According to a recent review of the literature, there is an increased risk of a fatal motor vehicle crash with a 0.04 blood alcohol content (BAC) and a dramatically increased risk at BAC's of 0.10 percent or higher (Perrine et al. 1989).

Blincoe and Faigin (1992) have developed fairly detailed estimates of motor vehicle crash costs for 1990, including a number of different components. Accidents with personal injury are divided by the severity of injury, using a 5-point Maximum Abbreviated Injury Scale (MAIS), with minimum/moderate injuries represented by categories AIS 1 and AIS 2 and severe and critical injuries by categories AIS 3 through AIS 5.

For purposes of this section, only data on direct-cost elements are included—that is, legal and adjudication costs, insurance administration, and vehicle and roadway damage. Costs for alcohol-related motor vehicle health care and productivity losses due to premature mortality and morbidity have been estimated elsewhere in this report. The cost estimates by Blincoe and Faigin are built on detailed NHTSA information about the following factors: (1) the number of accidents classified by the greatest level of injury severity (fatal, property damage only, and accidents with injuries classified by AIS severity level); (2) the costs per type of accident, by category for 1992; and (3) the percent of motor vehicle crashes in each AIS category caused by alcohol abuse. The system attempts to account for all costs associated with an accident, including multiple vehicles and multiple victims. Estimates of alcohol involvement by level of crash severity were determined by using NHTSA data on the proportion of crashes (fatalities, severe/critical injuries, minimum/moderate injuries, and property damage) involving alcohol-impaired drivers with a BAC of 0.10 percent or higher. If the costs related to crashes with drivers who had BAC's below 0.10 were included, then attribution factors and costs would be about one-fifth higher (i.e., the mortality attribution factor would be 50 percent instead of 39.7 percent).

Estimates from Blincoe and Faigin for 1990 were inflated to 1992 using the consumer price index (CPI) all-items index. The 1992 motor vehicle crash costs attributed to alcohol abuse were $13.6 billion (see table 6.17).

Table 6.17

Cost of Alcohol and Drug Abuse-Related Motor Vehicle Crashes, 1992
(millions of dollars)

		Type/Severity of Crash			
Type of Cost	**Total**	**Fatal**	**Severe/ Critical Injury**	**Minimum/ Moderate Injury**	**Property Damage Only**
Legal/court costs	$9,512	$3,390	$3,354	$2,768	—
Insurance administration	$12,513	$2,310	$3,795	$3,132	$3,403
Vehicle and roadway damage	$49,032	$385	$1,243	$16,062	$31,342
Total	**$71,057**	**$6,085**	**$8,392**	**$21,962**	**$34,746**
Percent attributed to alcohol abuse	19.2%	39.7%	31.5%	17.0%	13.9%
Total attributed to alcohol abuse	**$13,619**	**$2,416**	**$2,640**	**$3,734**	**$4,830**

SOURCE: Derived from Blincoe and Faigin (1992).

NOTE: Components may not sum to totals because of rounding.

6.5 Fire Damage and Control

Although alcohol has been implicated in more than 50 percent of fire-related deaths in a number of studies (NIAAA 1993), it appears that alcohol is much less frequently involved with fire-related losses. Berry and Boland (1973) reviewed the sparse literature and concluded that about 6.1 percent of structural fire loss was alcohol related. This is because alcohol-related fires appear to be primarily due to inebriated smokers falling asleep while smoking. That study estimated that 11.2 percent of economic losses from fire were alcohol related. In lieu of more recent reviews, this study adopts the same attribution factors. These factors were also employed in Cruze et al. (1981) and in Rice et al. (1990). Thus, 6.1 percent of structural fire losses totaling $6.96 billion ($425 million) are attributed to alcohol, and 11.2 percent of fire protection services of $10.4 billion ($1.165 billion) are attributed to alcohol. (Estimates of fire loss and protection costs are from U.S. Bureau of the Census 1994.)

7. ANALYSIS AND DISCUSSION

Based on the estimates of the economic costs of alcohol and drug abuse presented in chapters 1 through 6 of this report, this chapter addresses two additional questions: (1) Who bears the costs of alcohol and drug abuse? and (2) Does it appear that costs are generally greater than, less than, or the same as in previous studies? In short, more than one-half the economic impact of alcohol and drug abuse is passed along to persons who do not abuse alcohol or drugs, including institutions, employers, and families. Moreover, after adjusting for inflation and increases in the population, it appears that the economic burden of alcohol and drug abuse is substantially higher than has been reported in previous studies. For drug abuse, this appears largely to represent a real increase in the costs. For alcohol abuse, it is clear that much of the difference is the result of different approaches taken to estimation of several cost components, rather than a major increase in the problem and its associated costs. The following sections provide more detail on the derivation of and justification for these conclusions. The chapter concludes by presenting projections of the estimates obtained in this study (which are for 1992) to 1995, reflecting corrections for inflation and population changes, and by identifying key topics for future research.

7.1 Who Bears the Costs of Alcohol and Drug Abuse?

More than one-half of the economic impact of drug problems is borne by or transferred to the nonabusing population. Out of the $97.7 billion in drug abuse costs, the nonabusing population bears an estimated $54.8 billion, or 56 percent, of the costs (see table 7.1). Abusers bear $42.9 billion, and arguably the loss by abusers may be lower than this because the financial burden is often shifted to other members of their households and because they participate in underground economies such as drug trafficking, gambling, and prostitution, which generate income. The estimated costs of alcohol abuse fall heavily on alcohol abusers (including their household members). About $66.8 billion (45 percent) is borne by abusers, but an even greater share—$81.2 billion—is borne by nonabusers. Alcohol abusers may bear less of the cost than this, because they, too, shift effects to household members.

Table 7.1

Where the Burden of Drug and Alcohol Problems Falls
(billions of dollars)

	Alcohol	Drugs
Abusers and households	$66.8	$42.9
Government	$57.2	$45.1
Private insurance	$15.1	$3.1
Victim losses	$8.9	$6.5
TOTAL	**$148.0**	**$97.7**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

The largest share of the costs that are shifted are borne by governments (which ultimately means by taxpayers and those who would have received benefits of reduced taxes or additional government services). Governments bear 46.2 percent of total drug abuse costs and 38.6 percent of total alcohol costs. Private health and life insurance bears 3.2 percent of drug abuse and 10.2 percent of alcohol abuse costs. Nonabusers (actually, victims of crime and accidents) directly bear 6.7 percent of drug abuse and 6 percent of alcohol costs, respectively. Of course, all of the costs borne by government and private insurance are ultimately transferred to taxpayers and insurance policy holders, who are predominantly nonabusers.

The costs/effects of drug and alcohol abuse are spread throughout society (to nonusers) through the following mechanisms:

- Impacts on nonusers,
- Government control efforts, and
- Insurance and social systems (insurance and tax systems).

First, there is evidence that abuse of drugs and alcohol are causal factors in crime as well as transportation accidents that affect nonabusers (see chapter 6 of this report). Largely because of these effects on nonusers, society expends substantial resources attempting to control the consequences of drug and alcohol abuse through the criminal justice system and public health efforts. Also, the effects of drugs and alcohol that might appear to fall on the abusers themselves are often shifted to nonusers. For example, the costs of health problems are transferred through private and public health insurance; lost earnings result in reduced tax revenues and may also be offset through social insurance/welfare programs (unemployment and disability insurance and income supplements).

The following sections present the approach taken to estimating how the economic costs of drug and alcohol abuse have been distributed across several major sectors of society: abusers (and their households); Federal, State, and local governments; private insurance; and nonabusing victims. The results of the analyses for alcohol and drug abuse are presented in tables 7.2 and 7.3, respectively.

7.1.1 The Burden on Employers

This study, like those before it (e.g., Rice et al. 1990), has estimated worksite productivity effects in terms of lost earnings of drug and alcohol abusers. Certain data sets have been analyzed that have yielded plausible estimates about this dimension of drug and alcohol effects. However, few studies (and no rigorous studies) estimate the other costs to a worksite due to drug and alcohol abuse among the workforce. The analyses of lost earnings (section 5.3) in fact indicate that worksites shift at least some of the productivity differential of drug- and alcohol-impaired workers to the workers themselves in the form of lower compensation. To the extent that drug and alcohol abuse cause workers to perform below the levels implied by their wages/salaries, these costs are borne by the worksites in the form of higher costs. Such costs must then be absorbed by a company through a combination of decreased profits, increased product/service

Table 7.2

Economic Costs of Alcohol Abuse, 1992
(millions of dollars)

	Total Cost	Abuser and Household	Government			Private Insurance	Victims of Abusers
			Total	Federal	State/ Local		
HEALTH CARE COSTS							
Alcohol treatment—community	$3,609	413	2,323	1,083	1,241	873	
Alcohol treatment—Federal	$437		437	437			
Alcohol prevention	$1,088		1,088	923	165		
Alcohol research, training	$257		257	218	39		
Alcohol treatment insurance admin.	$182		132	62	71	50	
Treatment of comorbidity	$12,611	2,338	5,347	4,048	1,299	4,666	260
Comorbidity insurance admin.	$641		340	257	83	296	
PRODUCTIVITY COSTS							
Mortality—PDV[1] life earnings @ 6%	$31,327	14,58	9,584	5,463	4,121	1,278	5,880
Morbidity—lost earnings	$69,209	44,243	24,966	15,861	9,104		
Victims of crime—lost earnings	$1,012						1,012
Incarceration—inmate lost earnings	$5,449	4,032	1,417	808	609		
Crime career—foregone legit. earnings	–						
OTHER EFFECTS ON SOCIETY							
Crime—criminal justice system and property	$6,312	68	6,216	290	5,926		28
Social welfare administration	$683		683	549	134		
Motor vehicle crashes	$13,619	1,149	4,390		4,390	6,552	1,531
Fire destruction	$1,590					1,431	159
TOTAL	**$148,021**	**66,828**	**57,181**	**29,999**	**27,181**	**15,146**	**8,870**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

[1] "PDV" refers to the present discounted value of life earnings, calculated using a 6-percent discount rate.

Table 7.3

Economic Costs of Drug Abuse, 1992

(millions of dollars)

	Total Cost	Abuser and Household	Government			Private Insurance	Victims of Abusers
			Total	Federal	State/ Local		
HEALTH CARE COSTS							
Drug treatment—community	$2,838	325	1,827	851	976	686	
Drug treatment—Federal	$292		292	292			
Drug prevention	$726		726	616	110		
Drug research, training	$401		401	375	26		
Drug treatment insurance admin.	$143		104	48	56	39	
Treatment of comorbidity	$5,266	976	2,233	1,690	542	1,948	108
Comorbidity insurance admin.	$265		142	107	34	123	
PRODUCTIVITY COSTS							
Mortality—PDV[1] life earnings @ 6%	$14,527	8,204	4,459	2,542	1,917	292	1,620
Morbidity—lost earnings	$15,682	8,141	7,541	5,095	2,446		
Victims of crime—lost earnings	$2,059						2,059
Incarceration—inmate lost earnings	$17,907	13,250	4,657	2,655	2,002		
Crime career—foregone legit. Earnings	$19,198	11,655	4,992	2,846	2,147		2,551
OTHER EFFECTS ON SOCIETY							
Crime—criminal justice system and property	$17,970	348	17,429	4,481	12,948		193
Social welfare administration	$337		337	271	66		
Motor vehicle crashes	–						
Fire destruction	–						
TOTAL	**$97,659**	**42,899**	**45,140**	**21,870**	**23,270**	**3,089**	**6,531**

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

[1] "PDV" refers to the present discounted value of life earnings, calculated using a 6-percent discount rate.

prices, or reduced overall compensation for the workers. There are insufficient data to develop such estimates.

Alcohol- and drug-related reductions in earnings are partially shifted to other segments of society because employers generally withhold income and other social insurance taxes and make contributions toward health insurance and social insurance on behalf of employees. Thus, workers' earnings provide a basis for estimating some of these effects. (This is discussed further in section 7.1.5). Much of the government and health insurance shares are collected (or fail to be collected, in the instance of lower earnings) through employers. These effects have been allocated to the social institutions that make the primary disbursements on drug- and alcohol-related services.

7.1.2 The Burden on Households and Families

Although the primary finding of this section is that alcohol and drug abusers appear to bear the largest share of the economic effects on society, this share of the burden can also be shifted. Losses of earnings attributable to alcohol and drug problems affect everyone in a household (children, spouses, and others). Whether earnings are reduced through lower wage rates or reduced days of work, this loss would directly affect the well-being of any additional household members, particularly those who do not work or do not have an independent source of income.

Many other effects on family members may arise that are not fully reflected as economic effects presented in this report, including consequences for the family relationships, ability of substance-abusing family members to carry out their roles and responsibilities in the family, and abuse and neglect. Although research has documented higher prevalence of alcohol and drug abuse in families with pronounced dysfunction (e.g., the National Institute on Alcohol Abuse and Alcoholism [NIAAA] 1993), it is sometimes unclear whether alcohol or drug abuse is the cause or the consequence of family and interpersonal stress. Finally, removal from families of a person with alcohol or drug abuse problems may reduce one set of problems while introducing others.

7.1.3 Health Care Expenditures

Overall, about 80 percent of personal health care expenditures are paid through private or public insurance in the United States. It is estimated that almost 90 percent of health care services for community-based treatment of drug and alcohol abuse (this excludes prison- and jail-based services to inmates) is paid through insurance or direct government financing of services (Harwood et al. 1994). In addition, the Federal Government operates treatment services for veterans, dependents of the Department of Defense, and Native Americans (references in chapter 4 of this report). All alcohol and drug abuse prevention and training services have been allocated to government funding, of which it appears that about 85 percent is from Federal sources and 15 percent is from State and local sources (Office of National Drug Control Policy [ONDCP] 1994; National Association of State Alcohol and Drug Abuse Directors [NASADAD] 1994). Virtually all drug and alcohol abuse research is federally supported. These values primarily represent budgets for NIDA and NIAAA (ONDCP 1995; Office of Management and Budget 1993).

The costs of treating medical consequences attributed to drug and alcohol abuse have been allocated across sources of payment in proportion to national reimbursement patterns for all personal health services (National Center for Health Statistics [NCHS] 1995). The costs of administering health insurance systems have been allocated in proportion to estimated payments by sources.

7.1.4 Mortality—Lifetime Earnings

Much of this loss falls on the household members of the alcohol and drug abusers. However, nonabusing victims also constitute a major part of losses, including homicide victims, the 30 percent of motor vehicle crash fatalities who are passengers or nonintoxicated pedestrians, and certain drug-related AIDS cases (about 15 percent are heterosexual partners of injecting drug users and pediatric cases). Although life insurance offsets some of the loss of expected lifetime earnings, it is a small fraction. No estimates have been made of the number of households that receive social insurance because of the death of a member. Private life insurance made death benefit disbursements of $26 billion in 1992 (U.S. Bureau of the Census 1994), or about $12,000 per death in the United States. It is assumed that private life insurance paid out this amount on average for each of the 106,600 alcohol-related and 23,600 drug-related deaths in 1992. This number may be low because many of the decedents for drug- and alcohol-related causes tend to be in the prime of their working lives and may carry more insurance. However, it is also possible that relatively fewer drug and alcohol abusers have life insurance because of their relative youth, lifestyles, and problems in their work careers.

7.1.5 Morbidity—Lost Earnings

Lost earnings are generally thought to fall on the alcohol or drug abuser; however, it appears that only about 65 percent and 50 percent of such losses fall directly on the household of the alcohol or drug abusers, respectively. Out of the estimated losses in potential productivity (earnings plus nonmarket activities) from alcohol and drug abuse ($69.2 billion and $15.7 billion, respectively), governments are estimated to bear almost 30 to 35 percent of such losses through lost income and employment-related and sales tax payments. This loss only applies to losses of potential market productivity, which is about 85 percent of total potential productivity (the other 15 percent is from household productivity: this proportion is about 10 percent for males and 33 percent for females). The redistribution/allocation of lost earnings to government is based on shares of 1992 net national product (NNP) of $5.367 trillion. The NNP includes production based in the United States and excludes the import- and export-related components of the gross domestic and national product. The Federal Government received $936 billion (17.44 percent of NNP) and State and local governments received $706 billion (13.15 percent) from taxes, social insurance fund payments, and excise taxes (U.S. Bureau of the Census 1994).

The cost to government is further increased because of the value of social welfare transfer payments that are attributable to impairment or disability from drug and/or alcohol abuse. Although the value of transfer payments does not count in total costs to society (transfers represent almost equal gains to one part of society and losses to another part of society), it does shift part of the burden from alcohol and drug abusers and their families to the rest of society. This was about 3 to 4 percent (depending on the particular type of social welfare program) of beneficiaries/payments of the national social welfare system and was an estimated $3.5 billion and $5.6 billion for drug and alcohol abuse, respectively (section 6.3).

7.1.6 Crime-Related Costs

The national criminal justice system spent $94 billion in 1992 (U.S. Department of Justice 1995). This study has attributed $23.6 billion to alcohol and drug abuse, or about 25 percent of total national expenditures. Expenditures have been allocated across Federal, State, and local governments, based on the most recent Survey of Criminal Justice Expenditures and Personnel. For example, about 90 percent of prison inmates are in State institutions and 10 percent in Federal prisons. All jail inmates are in local institutions. Federal expenditures are also estimated from the National Drug Control Strategy (ONDCP 1995) and alcohol control (the Bureau of Alcohol, Tobacco, and Firearms) from the Federal budget (Office of Management and Budget 1993). Victim costs are estimated and reported in the respective tables and sections. These include victim loss of work time because of crime and, under mortality losses, the victim loss of present discounted value of expected lifetime productivity because of homicide. Another victim loss is the value of stolen and/or destroyed money and property.

7.1.7 Social Welfare Administration

The value of transfer payments has already been included under morbidity (above) as a government offset to personal lost earnings. The expense of administering the system, as well as of delivering direct services (such as family and child welfare services), is reported in this item. Drug- and alcohol-related expenses were estimated at $337 million and $683 million, respectively, or about 3 to 4 percent of total system administration expenses (depending on the type of social welfare program). About 80 percent of social welfare services and transfer payments are from Federal funds (U.S. Bureau of the Census 1994); thus, 80 percent of administration costs is allocated to the Federal Government and 20 percent to State and local governments.

7.1.8 Motor Vehicle Crashes and Fire Destruction

Estimated losses attributable to alcohol problems of $13.6 billion include vehicle and roadway damage, legal and court costs, and insurance administration. The allocation of alcohol-related motor vehicle health care costs and mortality (lost lifetime earnings) have been included in estimates under prior sections. All roadway damage ($3.8 billion) was assigned to State and local governments, which are primarily responsible for the upkeep on highways. Insurance administration ($3.1 billion) was assigned directly to private insurance. It was assumed that 90 percent of vehicle damage (estimated at $3.8 billion) was paid by private insurance and 10 percent was borne by victims of drunk drivers. Most States have laws requiring automobile liability insurance, although policies commonly do not cover collision or have high deductibles. Automobile insurance premiums (including liability) were $104.5 billion in 1992 (U.S. Bureau of the Census 1994), which is several times greater than estimated vehicle damage, suggesting that it is justified to assume that most of this cost was borne by private insurance. Alcohol abusers may pay higher insurance premiums as a result of driving infractions, but this has not been examined. It was assumed that of the $2.9 billion in legal and court costs, 20 percent were State and local costs for court expenses and that alcohol abusers and victims of alcohol-related crashes had equal levels of expenses (about $1.15 billion each). For the burden of fire damage ($1.6 billion), it is assumed that 90 percent of the alcohol-related fire damage was paid by private insurance and 10 percent was borne by nonabusing victims of such incidents. Fire insurance premiums were $7.1 billion in 1992—just about equal to the value of structural fire losses (U.S. Bureau of the Census 1994), which suggests that insurance does pay for most fire losses.

7.1.9 Victims of Crime

Crime losses estimated at $1 billion for alcohol and $2 billion for drugs were attributed to crime victims (those not fatally attacked) in the form of lost earnings. Homicide costs are included elsewhere under the costs of premature mortality and were addressed earlier in this report. Conceivably, some—if not much—of the earnings losses were borne by insurance mechanisms, such as sick leave or disability insurance, but for purposes of these calculations, it is assumed that victims bore all of these costs.

Another cost borne by victims of drug-related property crime is lost cash and property valued at $2.55 billion in 1992. Another $427 million was lost because of alcohol-related property crime. Together, these losses totaled about 30 percent of the stolen property. This value likewise accrues to the benefit of those engaging in crime and serves to offset lost legitimate income. Insurance might offset some of these losses as well. Such losses are again a transfer—albeit involuntary—from one segment of society to another. Thus, the value is not included directly in the calculation of the total economic costs to society, but it does figure in the calculations of who bears what part of the total burden.

7.1.10 Incarceration and Crime Career Losses—Lost Legitimate Earnings

A substantial amount of potential productivity is lost to the economy from incarceration of alcohol and drug abusers ($5.4 billion and $17.9 billion, respectively). Almost 600,000 inmates were incarcerated in 1992 because of drug- and alcohol-defined and related crimes (460,000 and 140,000, respectively). Although this $23 billion in lost potential productivity (almost $39,000 per inmate-year) initially constitutes a loss to the inmate, the burden is shifted somewhat as noted in section 7.1.5 because of losses in government tax and insurance trust revenues. This loss of potential tax revenue—estimated at almost $12,000 per inmate-year—compounds the cost of keeping inmates incarcerated, which is about $20,000 per year. It is also likely that members of alcohol and drug abusers' households may require or receive social welfare payments because a potential income earner is incarcerated. However, these costs have not been estimated.

The drug economy also involves significant losses of potential market productivity—about $19 billion—associated with a full-time equivalent of 600,000 drug abusers dropping out of the legitimate economy in order to engage in the drug economy and/or in a career of income-generating predatory crime (i.e., theft). As before, these losses are partially shifted to government because of losses in tax revenues and contributions to social welfare funds. Where the alcohol and drug abusers engage in income-generating predatory crime, this income is taken directly from their victims, and the cost is directly shifted (discussed in section 7.1.9 above). Drug abusers and alcohol abusers stole an estimated $2.55 billion and $427 million, respectively, in cash and property through personal crimes in 1992, and this was borne by victims. No estimates are available for commercial theft losses.

However, the economic impact of consensual criminal activities, such as drug activities, prostitution, and illegal gambling, is less specific than that of predatory crime. Although the legitimate economy incurs a loss, the individuals engaged in the "underground economy" are generating income for themselves. The estimated loss of legitimate potential earnings may be completely offset. Government may still realize tax revenue from sales and excise taxes on legitimate goods and services purchased by drug abusers. The loss associated with dropping out of the legitimate economy may be primarily from losses of income taxes and employment-related contributions to social insurance trust funds. This study does not make any attribution of economic benefits to participants from such activities. Clearly, important conceptual issues remain to be addressed concerning such activities that are beyond the charge of the current study.

7.1.11 Summary

The economic costs of drug and alcohol problems are distributed across all of society. Although significant costs arguably fall primarily on the abusers, more than one-half of all of the costs are shifted to other institutions and members of society. Even the costs that are most likely to fall on the drug and alcohol abusers themselves may be shifted at least partially to members of their households, such as children and spouses. It has not been possible in this study to estimate the losses that fall on employers; prior studies have also been unable to develop such estimates.

7.2 Comparison With Previous Studies

This section compares the results of this study with the results from other major studies of the economic costs of drug and alcohol abuse. Direct comparisons are made with Rice et al. (1990) and more general comparisons with Rufener et al. (1977), Berry et al. (1977), Cruze et al. (1981), and Harwood et al. (1984). After adjustment for inflation and population growth, the estimates from this study are of comparable magnitudes to those from the prior major studies on the economic effects of drug and alcohol abuse. Differences are understandable and explainable. Moreover, the total estimates are relatively consistent with each other in their magnitudes.

When considered at the finest level of detail, there have been literally hundreds of differences in data and methodology from study to study—and that is true in comparing this study with Rice et al. (1990). Still, it is fair to say that relatively consistent methodological approaches—using the human capital approach—have been applied to most of these studies. This is true in terms of the nature of effects that have been included in the estimates and how values have been estimated. Much of this consistency has to do with the fact that the methodology for producing cost-of-illness estimates has been developing for more than 40 years, with the landmark studies of Dorothy Rice in the 1960's setting forth general methodological principles and approaches that have been used in virtually all cost-of-illness studies since that time.

Differences in estimates over the years reflect several types of major changes. First, changes have occurred in the nature and magnitude of drug and alcohol problems, and there have been such significant changes over the time studied. Second, the data sets available have steadily changed, generally improving. Third, science has continued to develop knowledge about drug and alcohol problems, including health effects of alcohol and drug abuse and understanding of crime and other behavioral effects of alcohol and psychoactive drugs. Finally, valid differences of opinion exist over analytic methods and approaches, as well as interpretation of findings. The disciplines have not reached consensus about the extent of tangible or economic effects of drugs and alcohol on society, although this study—as those before it—is based on an attempt to portray plausible values about such effects.

7.2.1 Five Major Studies on Alcohol and Drug Costs

Figure 7.1 and table 7.4 compare these results with the prior estimates, making adjustments for inflation and population growth over the 17 years that these estimates cover. The current estimate for alcohol of $148 billion is almost exactly equal to the adjusted average of the four prior major studies ($144 billion), although it is 42 percent greater than that found by Rice et al. (1990). The drug abuse estimate of $97.7 billion is 50 percent greater than that of Rice et al. (1990). From the five major drug studies, there has been a clear trend of increasing cost estimates for drug abuse, representing increasingly large effects across the last 20 years.

Generally similar methodologies have been used to estimate the costs of alcohol abuse in each of the five studies. Although each successive study has incorporated the newest data and findings about the nature, extent, and impact of alcohol problems, generally these have not fundamentally changed the estimates. The estimate by Rice et al. (1990) yielded significantly lower estimates for health expenditures and reduced productivity than the prior studies. The present study has given intensive attention to those topics and documents the nature of the differences and the rationale and data that support the findings in this study (see in particular sections 4.2 and 5.3).

The current study has a comparable proportion of alcohol costs attributable to lost/reduced productivity in the workplace relative to the studies being discussed here—about 45 percent. The Rice et al. (1990) study had 39 percent of costs in this category, with a range of rates for Berry et al. (1977) (36 percent), Cruze et al. (1981) (48 percent), and Harwood et al. (1984) (57 percent). Using a new survey with a modified set of criteria for diagnosis (the NIAAA implementation of DSM–IV criteria), this study has higher estimates of prevalence (about twice as high as the ECA rates) but materially lower rates of impairment than previous studies using different surveys.

It will be important in the future to explore to what extent alternative diagnostic criteria applied to National Longitudinal Alcohol Epidemiological Survey (NLAES) data would yield different prevalence values (higher or lower) associated with different rates of impairment (higher or lower). For example, this study did find a particular subsample of persons with alcohol dependence (specifically, males who began drinking by age 15) with greater negative effects than for others. This analysis has primarily worked with the DSM–IV criteria applied to NLAES. It is clear that the nature and specifics of diagnostic criteria have a major impact on the findings.

The five major drug abuse estimates demonstrate a clear upward trend since 1975 that is generally attributable to increasingly severe effects of drugs. Although some notable methodological differences exist between the first study (Rufener et al. 1977) and all of the subsequent studies, there is evidence that much of the increase over the 17 years is due to the cocaine and HIV epidemics and to dramatic increases in drug-related incarceration. For example, State and Federal prisons in 1992 incarcerated about 8 times as many persons on drug offenses as in 1977 (213,000 versus 28,000) and about 3 times as many persons on crimes attributed to drugs, such as burglary (100,000 versus 32,000). The overall prison census almost tripled between 1977 and 1992 (U.S. Department of Justice 1994g).

The least stable cost component across the five drug studies has been the impact of drug abuse on employment and earnings. Actually, only one study (Harwood et al. 1984) incorporated a value for this component that constituted a significant proportion of total costs. The current study estimates this impact at about 60 percent more than was found by Rice et al. (1990) although it still constitutes only about 15 percent of total costs. Thus, it is not a significant source of difference between the findings of this study and those of the Rice et al. (1990) study and of studies before Harwood et al. (1984).

7.2.2 Comparison With Rice et al. (1990)

The estimates for costs of alcohol and drug abuse from this study are 42 and 50 percent greater, respectively, than the total values from Rice et al. (1990). Figure 7.2 and table 7.5 compare the total values as well as the respective major components of the costs. Estimates from Rice et al. (1990) have been adjusted to 1992 based on population growth (1 percent per year) plus inflation (medical consumer price index for health care expenditures, the all-items consumer price index for other costs, and the Bureau of Labor Statistics "employment compensation index" for all productivity effects). Note that under the sections of the report where findings are developed and discussed, there is a comparison with the methodology of Rice et al. (1990) if material differences exist between the two studies in this respect. The major similarities and differences for the principal cost categories are discussed below.

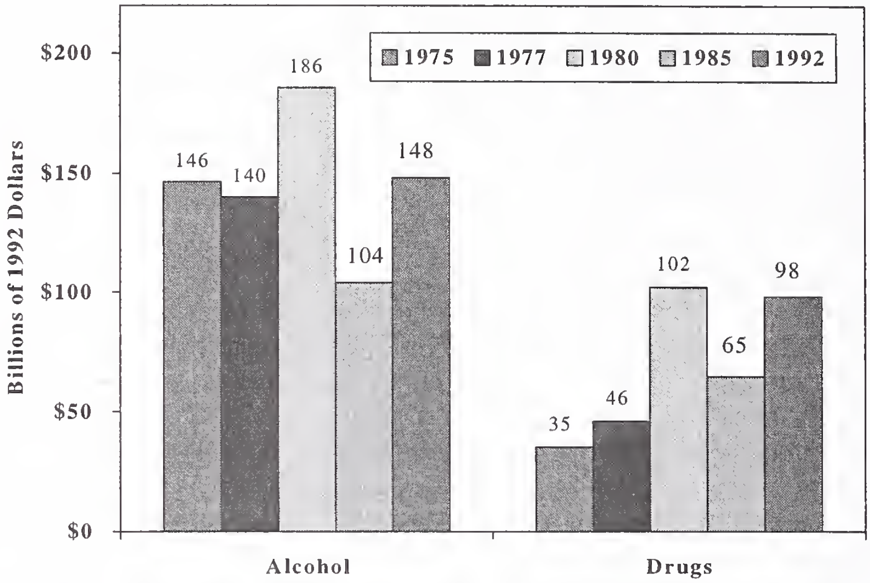
7.2.2.1 Drug and Alcohol Services

The primary difference is that hospital costs were a much larger proportion of alcohol costs in the estimates for 1985. More alcohol-related hospital episodes occurred in 1985 (about 500,000 versus 300,000 in 1992) and roughly the same number of drug-related episodes. However, the estimates for 1985 used a much higher cost per hospital day than has been employed in this report. The Rice et al. (1990) study used the average cost per hospital day for all diagnoses and all types of hospitals (in 1992, this average was more than $800 per day), while this study has used rates specific to treatment of drug and alcohol patients in hospital specialty treatment units ($300 to $350 per day in 1992). Both studies relied on data from specialty treatment providers to develop estimates of the volume of services of specialized providers.

7.2.2.2 Treatment of Medical Consequences

This is one of the two major areas of difference between this report and the Rice et al. (1990) study. Accordingly, this study has significantly higher cost estimates in these categories: $13.4 billion versus $4.9 billion (alcohol) and $5.5 billion versus $0.2 billion (drugs). The different approaches of the two studies have been analyzed and compared in section 4.2. The primary difference is that this study (as all of the prior studies on alcohol problems but none of the studies

Figure 7.1
Comparison of Estimates From the Major Cost-of-Illness Studies for Alcohol and Drug Abuse, Adjusted for Inflation and Population Growth



SOURCES: 1975 alcohol: Berry et al. (1977); 1975 drugs: Rufener et al. (1977); 1977 drugs and alcohol: Cruze et al. (1981); 1980 drugs and alcohol: Harwood et al. (1984); 1985 drugs and alcohol: Rice et al. (1990); 1992 drugs and alcohol: analysis by The Lewin Group; price and population data: U.S. Bureau of the Census (1993).

NOTE: Bars in bar chart are arranged in order as cited in key.

Table 7.4

Original and Adjusted Estimates of the Cost of Alcohol and Drug Abuse, 1975–1992
(billions of dollars)

Year of Estimate	Alcohol		Drugs	
	Original	Adjusted	Original	Adjusted
1975	42.8	146.0	10.3	35.0
1977	49.4	140.0	16.4	46.0
1980	89.5	186.0	49.4	102.0
1985	70.3	104.0	44.1	65.0
1992	148.0	148.0	97.7	97.7

SOURCE: 1975 alcohol: Berry et al. (1977); 1975 drugs: Rufener et al. (1977); 1977 drugs and alcohol: Cruze et al. (1981); 1980 drugs and alcohol: Harwood et al. (1984); 1985 drugs and alcohol: Rice et al. (1990); 1992 drugs and alcohol: analysis by The Lewin Group.

NOTE: Original estimates are adjusted to 1992 values based on inflation and population change between the original year of the estimate and 1992. Inflation change is a weighted average employment compensation index (80 percent), medical consumer price index (10 percent), and general consumer price index (10 percent).

on drugs) has drawn on the epidemiological literature to identify particular health problems that are causally linked to alcohol and drug problems, respectively. Rice et al. (1990) generally did not use this literature or approach, except for estimates of fetal alcohol syndrome and in the analysis of premature mortality, where it was the primary approach. Rice et al. (1990) recognized the possibility that studies of attribution factors for co-occurring disorders based on mortality might yield different values than studies based on morbidity. Instead, the Rice et al. (1990) study analyzed the impact on hospital length of stay from having a nonprimary diagnosis of alcohol or drug abuse or mental illness. This study has adopted the contribution of calculating the increment in hospital length of stay, but it has also incorporated data that make attribution to drug and alcohol abuse of the proportion of hospital stays for selected disorders.

Second, this study has reviewed the epidemiological literature about the relationship of drug abuse to several specific health problems (e.g., HIV infection, hepatitis, and tuberculosis) and developed estimates of attribution factors and costs due to drug abuse. This analysis was performed using the approach previously used to estimate the costs of fetal alcohol syndrome. Although Rice et al. (1990) did estimate the costs of HIV, other health problems had not been included in previous studies, primarily because of a lack of biomedical research. The dramatic increase in incidence of HIV from 1985 to 1992 is one underlying factor giving rise to the greater economic impact of drug abuse documented in this report.

7.2.2.3 Premature Mortality

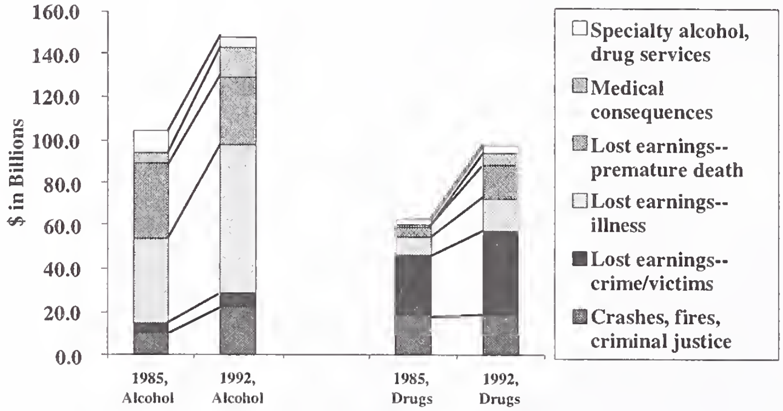
This study has used the same methodology as that used by the previous study as well as by most of the major studies. The difference between the two sets of estimates for drugs is primarily due to the advance of the HIV epidemic since 1985. The major differences in the alcohol estimates are associated with this study's incorporation of the following:

- Use of a higher attribution factor for suicides (28 percent versus 13 percent, which added almost 5,000 deaths to the total);
- Use of a modestly lower attribution factor for motor vehicle deaths (42 percent versus 51 percent); and
- Addition of a small fraction of deaths associated with cerebrovascular disease (which added about 10,000 deaths).

Alcohol costs declined relative to the Rice et al. (1990) numbers, because the age distribution shifted from younger decedents to older decedents (e.g., traffic fatalities fell by 6,000 persons and cerebrovascular deaths increased by 10,000).

Figure 7.2

Changes in Costs of Alcohol and Drug Abuse Between Rice et al. (1990) and Present Study



SOURCES: Rice et al. (1990) estimates for 1985 adjusted for increases in population and relevant prices; analysis by The Lewin Group.

NOTE: Bar sections in bar chart are arranged in order as cited in key.

Table 7.5

Changes in Inflation- and Population-Adjusted Costs of Alcohol and Drug Abuse Between Present Study and Rice et al. (1990)

(millions of 1992 dollars)

	Alcohol		Drugs	
	1985	**1992**	**1985**	**1992**
Specialty alcohol and drug services	$10,172	$5,573	$3,735	$4,400
Medical consequences	$4,935	$13,247	$226	$5,531
Lost earnings—premature death	$34,573	$31,327	$4,740	$14,575
Lost earnings—illness	$39,482	$69,209	$8,694	$15,682
Lost earnings—crime/victims	$4,564	$6,461	$27,753	$39,164
Crashes, fires, criminal justice, etc.	$10,307	$22,204	$18,537	$18,307
TOTAL	**$104,033**	**$148,021**	**$63,685**	**$97,659**

SOURCES: 1985 estimates from Rice et al. (1990); 1992 estimates by The Lewin Group.

NOTE: Components may not sum to totals because of rounding. Rice et al. (1990) estimates for 1985 adjusted for increases in population and relevant prices.

7.2.2.4 Morbidity-Impaired Productivity

Impacts of illness on productivity account for the major difference between the prior study and this study (discussed in greater detail in section 5.3). Higher estimates of alcohol-related costs have been developed primarily based on analysis of the NLAES. The NLAES offers certain specific advantages relative to other data bases, including being current, use of the new diagnostic criteria, and a relatively large sample size. Rice et al. (1990) used the Epidemiologic Catchment Area (ECA) study, which collected data in the early 1980's and used the prior DSM–III diagnostic criteria. Also, NLAES has better measures of labor market success than does the ECA study. Analysis of NLAES found higher prevalence of lifetime alcohol dependence (up to twice as high as in the ECA), although proportional effects of alcohol problems on earnings that are somewhat lower than Rice et al. (1990) and costs for drugs that are modestly higher.

7.2.2.5 Crashes and Criminal Justice Costs

Very similar methodologies have been used to estimate crime-related costs, although modest changes have been made to the attribution factors, primarily because of incorporation of more current data. Accordingly, the adjusted estimates for Rice et al. (1990) are very similar to those of the present study.

Motor vehicle crash costs have increased significantly, however. This is because much better data are now available about the causal involvement of alcohol in nonfatal crashes than for earlier studies. The causal rates used in this study for such crashes are about two to three times greater than values used in the prior alcohol studies, which have all used the same rates since Berry et al. (1977).

7.2.2.6 Lost Earnings From Crime

The change in these costs is predominantly because the corrections system incarcerated about 90 percent more inmates for alcohol- and drug-related charges in 1992 than in 1985. Thus, the number of persons incarcerated for alcohol- and drug-related offenses increased significantly. The increase was greatest for drug offenses. This study found that 220,000 inmates were incarcerated in 1992 in State and Federal prisons for drug-law violations, compared with 52,000 in 1985. This study and the prior study estimate the same full-time equivalent number of heroin addicts primarily engaged in "crime careers," but the number of nonheroin addicts is estimated to have doubled from 600,000 to 1.2 million.

7.3 Updated Estimates for 1995

The final element of this study is to develop more current estimates of costs, recognizing—as was done in Rice et al. (1990) and Harwood et al. (1984)—that it is both desirable and reasonable to make updated estimates based on the estimates in this report. The approach taken to making these updates is identical to the methodology employed in comparing this study's estimates with Rice et al. (1990) and with the prior major studies of the economic costs of alcohol and drug abuse.

Estimates of the five major cost components are updated for recent changes (total change over the 3-year interim) in population and in prices. Between 1992 and 1995, the population grew by 3.0 percent, the medical consumer price index (CPI) increased by 16.0 percent, the general CPI increased by 8.6 percent, and the hourly compensation index increased by 8.2 percent.

In developing the updated estimates, each of the 1992 values is increased by 3 percent for population and then further increased by the growth in the appropriate price index. The health care components (alcohol and drug abuse and medical consequences) are both increased by 16 percent (for the medical CPI). All of the productivity impacts (mortality, morbidity, and other related impacts) are increased by 8.2 percent. Other impacts are increased by 8.6 percent.

Total costs of alcohol and drug abuse are each estimated to increase 12.5 percent between 1992 and 1995 (see table 7.6). Alcohol abuse costs were an estimated $166.5 billion, and drug abuse costs were $109.8 billion in 1995.

7.4 Topics for Future Study

In many respects, this entire report can be read as an agenda for future research on the epidemiology, etiology, and economic effects of alcohol and drug abuse disorders. The objective has been to develop a relatively comprehensive set of cost estimates that address the major economic effects of alcohol and drug abuse. There are few cost components that cannot be improved with more and better data, which would support more probing analysis. Given this disclaimer, several topics continue to pose major challenges, as much because of their apparent magnitude as because of their complexity. These will be briefly identified here so that the interested reader may review the issue in the appropriate sections of the report.

Medical consequences of alcohol and drug disorders. The attribution factors used for alcohol abuse should be improved by undertaking a current review of the literature, which would differentiate causal studies based on mortality and morbidity (or at least health care utilization). The co-occurrence and causal link between mental disorders and alcohol and drug disorders is particularly important for further research. Another aspect of this research should examine the impact of alcohol and drug disorders on general utilization of health care services.

Health benefits of moderate alcohol consumption. The increasing evidence that moderate alcohol consumption seems to yield health benefits is cause for further study. The results should be particularly useful to those who are attempting to assess the costs and benefits of public policies with respect to alcoholic beverages.

"Willingness-to-pay" analyses. The typical estimates generated by willingness-to-pay studies for the value of life or quality of life are many times larger than other effects and costs for other threats to safety and life. Both the theory of willingness-to-pay and the application to alcohol and drug problems need to be examined to determine how this may or may not be applied to economic analysis. Cost-benefit studies performed for the U.S. Office of Management and Budget use the willingness-to-pay approach. While the safety field has applied the willingness-to-pay approach, the health field has made limited use of this technique.

Table 7.6

Updated Cost Estimates: 1992 Estimates and Inflation- and Population-Adjusted Costs of Alcohol and Drug Abuse for 1995

(millions of current-year dollars)

	Alcohol		Drugs	
	1992	**1995**	**1992**	**1995**
Specialty alcohol and drug services	$5,573	$6,660	$4,400	$5,258
Medical consequences	$13,247	$15,830	$5,531	$6,623
Lost earnings—premature death	$31,327	$34,921	$14,575	$16,247
Lost earnings—illness	$69,209	$77,150	$15,682	$17,481
Lost earnings—crime/victims	$6,461	$7,231	$39,164	$43,829
Crashes, fires, criminal justice, etc.	$22,204	$24,752	$18,307	$20,407
TOTAL	**$148,021**	$166,543	**$97,659**	$109,832

SOURCE: Analysis by The Lewin Group.

NOTE: Components may not sum to totals because of rounding.

The impact of alcohol and drug abuse on earnings. This constitutes the largest component of costs for alcohol abuse and a material cost for drug abuse. There have been very few data bases available to study this problem. Although this study has performed the first analyses to date on NLAES, there is a need for further work in order to determine how different diagnostic criteria correlate with employment and earnings. Longitudinal studies would be particularly interesting.

The impact of employee alcohol and drug problems on employers. While estimates of this type of impact have been attempted neither in this report nor in prior studies of the costs of alcohol and drug abuse, there is more than theoretical reason to believe that such costs are real and affect employers. These impacts would in theory reduce the productivity of workers, increasing costs and possibly increasing the price of goods and services to consumers and/or reducing the profits of employers. There is an opportunity to pursue this line of research, which could have important implications by helping employers to better understand the stake that they have in offering alcohol and drug prevention and treatment services for their workers.

The role of alcohol and drugs in crime. The data about crime, alcohol, and drugs are quite rudimentary, and the level of rigor and sophistication applied to analysis to date has generally been low. The challenges to address this topic are monumental, given the very high level of stigma likely to be associated with the study of illegal activities.

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APPENDIX A. HEALTH DISORDER CODES

Analyses of health care utilization and of mortalities resulting from alcohol and drug abuse are reported in chapters 4 and 5. These analyses rely on essentially the same set of diagnostic codes and attribution factors for the analysis of databases. The ICD-9 codes used in this study are presented in table A.1, along with the corresponding attribution factors. The table differentiates between conditions that are definitionally 100 percent caused by alcohol or drug abuse (e.g., drug psychoses) and those conditions for which alcohol or drug abuse are contributing factors.

Note also that the mortality data reported in chapter 5 rely on "E" codes for injuries and poisonings, whereas hospital and ambulatory care data reported in chapter 4 rely instead on the series 800 and 900 codes. The reason for this is that many injuries and poisonings never result in hospitalization—the "E" code assigned in an emergency room, for example, may be the only code that exists. On the other hand, if a patient is admitted or cared for by a physician outside the emergency room, standard diagnostic codes are apt to replace the E code as the primary diagnosis.

Table A.1

ICD-9 Diagnostic Codes Specific and Related to Drug and Alcohol Abuse and Dependence and Associated Causality Factors

Illness or Injury	ICD-9 Code	Percent Attributed in This Study	Age Range
100% Drug-Caused Conditions			
Drug psychoses	292	100	all
Drug dependence	304	100	all
Nondependent abuse of drugs	305.2–305.9	100	all
Polyneuropathy due to drugs	357.6	100	all
Narcotics affecting fetus or newborn via placenta or breast	760.72	100	all
Hallucinogens affecting fetus or newborn via placenta or breast	760.73	100	all
Drug withdrawal syndrome in newborn	779.5	100	all
Poisoning by opiates and related narcotics	965.0	100	all
Poisoning by sedatives and hypnotics	967	100	all
Poisoning by CNS muscle tone depressants	968.0	100	all
Poisoning by psychotropic agents	969	100	all
Poisoning by CNS stimulants	970	100	all
Drug-Related Conditions			
Accidental poisoning by drugs, medicaments, and biologicals	E850–858	NA	
Agricultural and horticultural chemical and pharmaceutical preparations other than plant foods and fertilizers	E863	NA	

Table A.1 (Cont'd)

ICD-9 Diagnostic Codes Specific and Related to Drug and Alcohol Abuse and Dependence and Associated Causality Factors

Illness or Injury	ICD-9 Code	Percent Attributed in This Study	Age Range
Heroin, methadone, other opiates and related narcotics, and other drugs causing adverse effects in therapeutic use	E935.0–E935.2; E937–E940	NA	
Injury undetermined whether accidentally or purposely inflicted from poisoning by drugs, medicaments, and other	E980	NA	
Homicide and injury purposely inflicted by other persons (age ≥ 15)	E960–E969	NA	
Tuberculosis	010–018	NA	
100% Alcohol-Caused Conditions			
Alcoholic psychoses	291	100	all
Alcohol dependence syndrome	303	100	all
Nondependent abuse of alcohol	305.0	100	all
Alcoholic polyneuropathy	357.5	100	all
Alcoholic cardiomyopathy	425.5	100	all
Alcoholic gastritis	535.3	100	all
Alcoholic fatty liver	570.0	100	all
Acute alcoholic hepatitis	570.1	100	all
Alcoholic cirrhosis of liver	570.2	100	all
Alcoholic liver damage, unspecified	570.3	100	all
Fetal alcohol syndrome	760.71	100	all
Excessive blood level of alcohol	790.3	100	all
Toxic effects of ethyl alcohol	980.0	100	all
Accidental poisoning by alcohol	E860.0, E860.1	100	all
Alcohol-Related Conditions			
Respiratory tuberculosis	011–012	25	≥ 35
Malignant neoplasm of lip, oral cavity, and pharynx	140–149	50 (men) 40 (women)	≥ 35
Malignant neoplasm of esophagus	150	75	≥ 35
Malignant neoplasm of stomach	151	20	≥ 35
Diabetes mellitus	250	5	≥ 35
Essential hypertension	401	8	≥ 35

Table A.1 (Cont'd)

ICD-9 Diagnostic Codes Specific and Related to Drug and Alcohol Abuse and Dependence and Associated Causality Factors

Illness or Injury	ICD-9 Code	Percent Attributed in This Study	Age Range
Cerebrovascular disease	430–438	7	≥ 35
Pneumonia and influenza	480–487	5	≥ 35
Diseases of esophagus, stomach, and duodenum	530–537 (excluding 535.3)	10	≥ 35
Chronic hepatitis	571.4	50	≥ 35
Cirrhosis of liver without mention of alcohol	571.5	50	≥ 35
Other chronic nonalcoholic liver damage	571.8	50	≥ 35
Unspecified chronic liver disease without mention of alcohol	571.9	50	≥ 35
Portal hypertension	572.3	50	≥ 35
Acute pancreatitis	577.0	42	≥ 35
Chronic pancreatitis	577.1	60	≥ 35
Alcohol–Related Injuries/ Incidents			
Motor vehicle traffic and nontraffic accidents	E810–E825	42	≥ 15
Pedal cycle and other road vehicle accidents	E826,E829	20	≥ 15
Water transport accidents	E830–E838	20	≥ 15
Air and space transport accidents	E840–E845	16	≥ 15
Accidental falls	E880–E888	35	≥ 15
Accidents caused by fires and flames	E890–E899	45	≥ 15
Accidental drowning and submersion	E910	38	≥ 15
Suicide and self-inflicted injury	E950–E959	28	≥ 15
Homicide and injury purposely inflicted by other persons	E960–E969	46	≥ 15
Other injuries and adverse effects	E901, E911, E917, E918, E919, E920, E922, E980	25	≥ 15
Injuries and poisoning*	800–968, 980–995 (excluding 965.0, 967, 968.0, 980.0)	10	≥ 15

SOURCES: Stinson et al. (1993); Bloss (1995), personal communication.

*NOTE: A point of departure from the mortality estimates attributed to alcohol by Stinson et al. (1993) is that this study attributes 10 percent of nonfatal accidents and injuries to alcohol. Stinson's research concludes that alcohol caused 16 to 46 percent of certain accidents and injuries in which the victims died before admission to a hospital. This study attributes 10 percent of all nonfatal accidents and injuries that result in hospitalization or outpatient care to alcohol.

APPENDIX B. SUPPLEMENTAL TABLES FOR PRODUCTIVITY EFFECTS

Table B.1

Present Value of Expected Lifetime Productivity, by Age, Gender, and Discount Rate, 1992

Age	Males				Females			
	Discount Rate							
	2%	3%	4%	6%	2%	3%	4%	6%
Under 1 year	$1,174,844	$796,868	$540,496	$266,965	$935,418	$640,454	$438,501	$222,167
1–4	1,207,409	839,078	583,109	302,060	960,870	674,044	472,838	251,248
5–9	1,264,125	917,724	666,246	376,014	1,005,589	736,918	540,030	312,633
10–14	1,329,488	1,013,187	772,138	479,322	1,057,268	813,330	625,674	398,408
15–19	1,383,643	1,102,512	878,501	593,485	1,090,748	875,812	703,230	485,386
20–24	1,392,669	1,150,311	950,129	684,166	1,074,606	891,211	739,115	539,655
25–29	1,339,809	1,138,472	967,391	730,411	1,005,998	854,739	726,223	551,397
30–34	1,234,571	1,074,547	935,265	734,474	903,020	782,758	678,513	531,583
35–39	1,086,645	966,071	858,876	698,385	780,158	688,551	607,701	489,820
40–44	906,233	821,251	744,239	624,795	645,701	579,387	519,884	430,309
45–49	703,411	648,453	597,788	516,717	507,196	462,055	420,932	357,186
50–54	495,242	463,193	433,218	383,990	372,678	344,084	317,684	275,684
55–59	306,461	289,856	274,150	247,882	251,866	235,173	219,586	194,239
60–64	162,855	155,004	147,532	134,871	154,264	145,280	136,819	122,803
65–69	81,016	77,404	73,953	67,993	86,717	82,194	77,907	70,665
70–74	40,266	38,785	37,359	34,865	46,380	44,265	42,247	38,763
75–79	17,167	16,568	15,989	14,985	23,260	22,372	21,517	20,005
80–84	8,412	8,181	7,957	7,543	10,999	10,673	10,357	9,777
85 & over	$2,450	$2,421	$2,392	$2,335	$2,659	$2,627	$2,595	$2,534

SOURCE: Rice (1997), personal communication. The values for 3 percent were calculated as the geometric mean of the 2- and 4-percent rates, respectively, for males and females.

Table B.2

Logistical Regression Results for Past Month Employment
Dependent Variable = Earnings Past Month > 0
Coefficients and (Asymptotic Standard Errors)

	Males		Females	
	Reduced Model	Full Model	Reduced Model	Full Model
Intercept	–1.1821** (0.2567)	–1.2499** (0.2824)	–1.5905** (0.2149)	–2.0139 ** (0.2527)
Age	0.1909** (0.0142)	0.1381** (0.0147)	0.1863** (0.0109)	0.1648** (0.0113)
Age Squared	–0.0028** (0.0002)	–0.0022** (0.0002)	–0.0028** (0.0001)	–0.0025** (0.0001)
Black	–0.6930** (0.0909)	–0.4145** (0.0958)	–0.2316** (0.0688)	–0.1860** (0.0688)
Hispanic	–0.2712** (0.1417)	0.0657 (0.1584)	–0.5269** (0.0940)	–0.2109 (0.0876)
Less than High School Graduate		0.1372 (0.1346)		0.0851 (0.1099)
High School Graduate		0.6499* (0.1247)		0.7874** (0.0862)
Some College		1.0136** (0.1132)		1.0816** (0.1035)
College Graduate		1.1207** (0.1716)		0.8987** (0.1097)
Graduate/Professional School		1.2577** (0.1497)		1.2182** (0.1214)
Married or Living Together As If		0.6314** (0.0731)		–0.3524** (0.0509)
Professional Occupation		0.1610* (0.0839)		0.5482** (0.0475)
Reside in Rural Area		–0.0128 (0.0663)		–0.0161 (0.0608)
Children Under 13 in Household		0.0185 (0.0415)		–0.3915** (0.0259)
Alcohol Dependence, Early Drinking	–0.3903** (0.1705)	–0.2741** (0.1795)	–0.2583* (0.1836)	–0.2246 (0.1881)
Alcohol Dependence Ever, Later Drinking	0.1365* (0.0717)	0.1800** (0.0768)	0.1192 (0.0774)	0.0905 (0.0771)
Drug Dependence Ever	–0.1326 (0.1887)	0.0616** (0.1910)	–0.2975** (0.1105)	–0.2502** (0.1134)
Major Depression Ever	–0.1034 (0.0995)	0.0959 (0.1054)	–0.0083 (0.0562)	–0.0955 (0.0590)

*Indicates significance at 0.10 level.

**Indicates significance at 0.05 level.

Table B.3

Ordinary Least Squares Regression Results Earnings per Hour Dependent Variable = ln (Earnings Past Month/ Hours Worked) Coefficients and (Asymptotic Standard Errors)

	Males		Females	
	Reduced Model	**Full Model**	**Reduced Model**	**Full Model**
Intercept	0.0334 (0.1201)	–0.0516 (0.1415)	0.2809** (0.1027)	0.2719** (0.1023)
Age	0.1138** (0.0063)	0.0810** (0.0068)	0.0985** (0.0057)	0.0686** (0.0053)
Age Squared	–0.0012** (0.0001)	–0.0008** (0.0001)	–0.0011** (0.0001)	–0.0007** (0.0001)
Black	–0.3160** (0.0247)	–0.1706 ** (0.0245)	–0.1623** (0.0246)	–0.0618** (0.0247)
Hispanic	–0.2617** (0.0301)	–0.0586* (0.0325)	–0.1737** (0.0263)	–0.0238 (0.0209)
Less than High School Graduate		0.2628 (0.0588)		0.1006 (0.0632)
High School Graduate		0.4407** (0.0632)		0.2531** (0.0531)
Some College		0.5587** (0.0536)		0.4183** (0.0631)
College Graduate		0.7059** (0.0671)		0.5422** (0.0618)
Graduate/Professional School		0.8048 ** (0.0659)		0.6524** (0.0690)
Married or Living Together As If		0.1443** (0.0221)		0.0675** (0.0191)
Professional Occupation		0.2755** (0.0205)		0.3471** (0.0190)
Reside in Rural Area	–0.1595** (0.0261)	–0.0752** (0.0247)	–0.2261** (0.0304)	–0.1662** (0.0298)
Children Under 13 in Househol	0.0458** (0.0083)	0.0324** (0.0090)	–0.0259** (0.0092)	–0.0133 (0.0094)
Alcohol Dependence, Early Drinking	–0.1402** (0.0485)	–0.0695 (0.0460)	–0.0246 (0.0864)	–0.0007 (0.0822)
Alcohol Dependence Ever, Later Drinking	–0.0447* (0.0249)	–0.0255 (0.0226)	–0.0307 (0.0413)	–0.0404 (0.0385)
Drug Dependence Ever	–0.0990** (0.0480)		–0.0279 (0.0457)	0.0417 (0.0426)
Major Depression Ever	–0.0643** (0.0294)	–0.0695** (0.0280)	–0.0490 (0.0296)	–0.0745** (0.0268)

*Indicates significance at 0.10 level.

**Indicates significance at 0.05 level.

Table B.4

Outline for Estimation of Lost Earnings Using the RAND Microsimulation Technique for the Alcohol Dependent Population

(Note that making estimates for the drug dependent population is directly parallel to the following steps). For the Non-Alcohol Dependent (non-AD) population (but including anyone drug dependent) with earnings in the past month, estimate the following regression:

(1) Ln (Y) = f(Age, Ethnicity, Rural/Urban, Children, Depression, **DRUG DEPENDENCE**)
Where Y = earnings in the past month.
Estimate with Ordinary Least Squares

For the Alcohol Dependent (AD) population (only if alcohol dependent, whether or not start drinking by 15th birthday)

(2) Ln (Y) = f(Age, Ethnicity, Rural/Urban, Children, Depression, **DRUG DEPENDENCE, DRINK by 15**)

Estimate with Ordinary Least Squares

Calculate the smearing coefficient for the non-AD (Sn) and AD (Sa) populations respectively. This is done by saving residuals from the respective regressions and calculating the mean of the anti-logs of the residuals.

Calculate the impact of AD:

Predicted earnings of AD population **if NOT AD**, given coefficients (Bn) of characteristics X in Regression (1) estimated on the non-AD population: Age, Ethnicity, Rural/Urban, Children, Depression, **DRUG DEPENDENCE**

(3) $E(Yn) = \{\exp(X^*Bn) * Sn\}$

Predicted earnings of AD population **if AD**, given coefficients (Ba) of characteristics X in Regression (2) estimated on the AD population: Age, Ethnicity, Rural/Urban, Children, Depression, **DRUG DEPENDENCE, DRINK by 15.**

(4) $E(Ya) = \{\exp(X^*Ba) * Sa\}$

Estimated dollar impact of AD on the individual:
$E(Ya) - E(Yn) = \{\exp(X^*Ba)^*Sa\} - \{\exp(X^*Bn)^*Sn\}$

Sum these values (using appropriate sampling weights) to develop total population estimates. Adjust estimates for observations with missing data by adjusting the estimates up in proportion to the difference between the total population in the group and the weighted population from the survey.

Approach to Estimation of Losses From Excess Unemployment

A second level of analysis is necessary in order to estimate the costs of excessive unemployment among the AD population. This analysis couples selected regression results from the above analysis with the results from logistical regression analysis of unemployment and AD.

Estimate for the non-AD and AD populations, respectively:

Probability of Employment/Earnings (for males and females, respectively)

Pr(EMn) = f(Age, Ethnicity, Rural/Urban, Children, Depression, **DRUG DEPENDENCE**)

Estimate with Logistical Regression in SAS

Calculate the expected earnings if not affected (averaging in the expectancy of being employed and the expected wage if employed) for the AD population. This value for a given individual would be equal to their probability of being employed times their expected earnings if employed, based on the product of the logistical regression prediction of probability of being employed, and the smearing adjusted OLS regression results.

Defining Earned Income (EI) as the average across all individuals, including both those with and without employment (EM) and earnings (Y) in the period being analyzed, then expected Earned Income based on the experience of the non-AD population for a given individual with characteristics X is:

$$E(EIn) = Pr(EMn) * E(Yn) * Sn$$

evaluated at their values for X, with the smearing adjustment Sn. expected Earned Income for this AD individual with characteristics X is:

$$E(EIa) = Pr(EMa) * E(Ya) * Sa$$

Next, calculate the average and total earnings for the AD population using both of these measures. The loss in Earned Income for the AD population, factoring in both the employed and unemployed is equal to the difference in these two values:

$$Loss = E(EIa) - E(EIn)$$

This dollar estimate of total loss in Earned Income can be compared to their predicted earned income E(EIa).

Part of the total loss of Earned Income was estimated above in the analysis of loss of Earnings (Y) for the employed population, and this estimate of total loss can be disaggregated into the loss associated with the impact on Earnings (Y) if employed, and the loss from reduced levels of Employment (EM).

Table B.5

Productivity Losses for Victims of Crime by Type of Crime, 1992

			Percent Due To:		Productivity Losses* (millions of dollars)		
Type of Crime	**Number (000's)**	**Average Work Days Lost**	**Alcohol Abuse**	**Drug Abuse**	**Alcohol Abuse**	**Drug Abuse**	**Total Alcohol and Drug**
Rape	141	4.6	22.5	2.4	19	2	21
Assault	5,255	3.7	30.0	5.1	776	132	908
Robbery	1,226	4.4	3.4	27.2	24	195	220
Burglary	4,757	1.7	3.6	30.0	39	323	361
Larceny	20,312	1.7	2.8	29.6	129	1359	1,488
Auto Theft	1,959	2.7	3.5	6.8	25	48	72
TOTAL	33,650				1,012	2,059	3,071

SOURCE: U.S. Department of Justice (1994g), table 3.4, p. 249.

NOTE: Components may not sum to totals because of rounding.

*Based on average value of productivity of $133 per day.

Table B.6

Number of Incarcerations and Person Years Served Due to AOD by Type of Offense and Sex, 1992

Type of Offense	Incarcerations Due to Offense In:			Percent Offenses Due To:		Person Years Served for Crime in 1992 Due to:			
						Alcohol Abuse		Drug Abuse	
	Federal and State Prison	Local Jails	Total	Alcohol Abuse	Drug Abuse	Males	Females	Males	Females
Homicide	86,685	12,370	99,055	30.0	15.8	27,725	1,991	14,602	1,049
Assault	67,082	31,808	98,891	30.0	5.1	27,679	1,988	4,706	338
Sexual Assault	76,081	15,021	91,102	22.5	5.1	20,395	102	4,623	23
Robbery	127,892	29,599	157,491	3.4	27.2	4,996	359	39,967	2,870
Burglary	100,183	47,270	147,454	3.6	30.0	4,953	356	41,272	2,964
Larceny–Theft	40,089	34,901	74,989	2.8	29.6	1,959	141	20,710	1,487
Auto Theft	18,076	12,370	30,446	3.5	6.8	994	71	1,932	139
Drug Laws	217,594	101,609	319,203	0	100.0	0	0	297,817	21,387
Receiving Stolen Property	11,890	10,603	22,493	0	15.1	0	0	3,169	228
Drunk Driving	0	38,877	38,877	100.0	0	36,272	2,605	0	0
Liquor Laws	0	0	0	100.0	0	0	0	0	0
Drunkenness, Vice, Vagrancy	0	7,510	7,510	90.0	0	6,306	453	0	0
TOTAL	883,656	441,780	1,325,436			131,280	8,065	428,797	30,484

SOURCE: U.S. Department of Justice (1994g), tables 6.17, 6.21, and 6.29; pp. 591–600.

NOTE: Components may not sum to totals because of rounding.

Table B.7

Productivity Losses Due to Incarceration by Type of Offense and Sex, 1992
(millions of dollars)

Type of Offense	Alcohol Abuse			Drug Abuse			Total		
	Total	Males	Females	Total	Males	Females	Males	Females	Total
Homicide	1,158	1,105	53	610	582	28	1,687	81	1,768
Assault	1,156	1,103	53	197	188	9	1,291	62	1,353
Sexual Assault	816	813	3	185	184	1	997	3	1,001
Robbery	209	199	10	1,670	1,593	77	1,792	86	1,879
Burglary	207	197	10	1,724	1,645	79	1,843	89	1,931
Larceny–Theft	82	78	4	865	826	40	904	43	947
Auto Theft	42	40	2	81	77	4	117	6	122
Drug Laws	0	0	0	12,443	11,872	571	11,872	571	12,443
Receiving Stolen Property	0	0	0	132	126	6	126	6	132
Drunk Driving	1,515	1,446	7,076	0	0	0	1,446	70	1,515
Liquor Laws	0	0	0	0	0	0	0	0	0
Drunkenness, Vice, Vagrancy	263	251	12	0	0	0	251	12	263
TOTAL	5,449	5,233	215	17,907	17,093	814	22,326	1,030	23,356

SOURCE: U.S. Department of Justice (1994g), tables 6.17, 6.21, and 6.29; pp. 591–600.

NOTE: Components may not sum to totals because of rounding.

APPENDIX C. SUPPLEMENTAL TABLES FOR COSTS RELATED TO CRIME

Table C.1

Publicly Financed Criminal Justice System, Police Protection Costs by Type of Offense, 1992

	Arrests		Causal Factors (%)		Police Protection Costs[1] (millions of dollars)		
Type of Offense	**Number**	**Percent of Total Arrests**	**Alcohol Abuse**	**Drug Abuse**	**Alcohol**	**Drug**	**Total Alcohol and Drug**
Homicide	22,510	0.2	30.0	15.8	17	9	26
Aggravated Assault	507,210	3.6	30.0	5.1	388	66	454
Sexual Assault	39,100	0.3	22.5	2.4	22	2	25
Other Assaults	1,074,700	7.6	30.0	5.1	822	140	962
Robbery	173,310	1.2	3.4	27.2	15	120	135
Burglary	424,000	3.0	3.6	30.0	39	324	363
Larceny-Theft	1,504,500	10.7	2.8	29.6	107	1,135	1,243
Auto Theft	197,600	1.4	3.5	6.8	18	34	52
Driving Under Influence[†]	1,624,500	11.5	100.0	0	64	0	64
Liquor Laws[†]	541,700	3.8	100.0	0	21	0	21
Public Drunkenness[†]	832,300	5.9	100.0	0	33	0	33
Stolen Property	161,500	1.1	0	15.1	0	62	62
Prostitution	96,200	0.7	0	12.8	0	31	31
Drug Laws	1,066,400	7.6	0	100.0	0	2,719	2,719
Other	5,809,570	41.3	0	0	0	0	0
TOTAL	**14,075,100**	**100.0**	**NA**	**NA**	**1,547**	**4,644**	**6,191**

SOURCES: U.S. Department of Justice (1992b), table 2, p. 3; (1994b), tables 4 and 30, pp. 60, 218.

NOTE: Components may not sum to totals because of rounding.

[1] Total Police Protection Costs (PPC) were $31.8 billion in 1990; State and local CJS spending grew 13 percent (to $35.9 billion) from 1990 to 1992.

[†] PPC for these alcohol offenses estimated at $39.57 x number of arrests for each offense.

Table C.2

Publicly Financed Criminal Justice System, Legal and Adjudication Costs by Type of Offense, 1992

	Arrests		Causal Factors (%)		Legal and Adjudication Costs[1] (millions of dollars)		
Type of Offense	Number	Percent of Total Arrests	Alcohol Abuse	Drug Abuse	Alcohol	Drug	Total Alcohol and Drug
Homicide	22,510	0.2	30.0	15.8	4	2	7
Aggravated Assault	507,210	3.6	30.0	5.1	101	17	118
Sexual Assault	39,100	0.3	22.5	2.4	6	1	6
Other Assault	1,074,700	7.6	30.0	5.1	214	36	251
Robbery	173,310	1.2	3.4	27.2	4	31	35
Burglary	424,000	3.0	3.6	30.0	10	84	95
Larceny-Theft	1,504,500	10.7	2.8	29.6	28	296	324
Auto Theft	197,600	1.4	3.5	6.8	5	9	14
Driving Under Influence†	1,624,500	11.5	100.0	0.0	64	0	64
Liquor Laws†	541,700	3.8	100.0	0.0	21	0	21
Public Drunkenness†	832,300	5.9	100.0	0.0	33	0	33
Stolen Property	161,500	1.1	0.0	15.1	0	16	16
Prostitution	96,200	0.7	0.0	12.8	0	8	8
Drug Laws	1,066,400	7.6	0.0	100.0	0	708	708
Other	5,809,570	41.3	0	0	0	0	0
TOTAL	**14,075,100**	**100.0**	**NA**	**NA**	**491**	**1,210**	**1,701**

SOURCES: U.S. Department of Justice (1992b), table 2, p. 3; (1994b), table 25, p. 208.

NOTE: Components may not sum to totals because of rounding.

[1] Expenditures on total Legal and Adjudication Costs (LAC) were $16.55 billion in 1990; adjusting up 13 percent for inflation and down 50 percent for civil cases yields $9.35 billion.

†LAC for these alcohol offenses estimated at $39.57 x number of arrests for each offense.

Table C.3

Publicly Financed Criminal Justice System, State and Federal Correction Costs by Type of Offense, 1992

	Number of State and Federal Prisoners (1992)			Causal Factors (%)		State and Federal Correction Costs (millions of dollars)		
Type of Offense	**State**	**Federal**	**Percent of Total Prisoners**	**Alcohol Abuse**	**Drug Abuse**	**Alcohol**	**Drug**	**Total Alcohol and Drug**
Homicide	85,160	1,525	9.8	30.0	15.8	550	290	840
Assault	65,879	1,204	7.6	30.0	5.1	426	72	498
Sexual Assault	75,519	562	8.6	22.5	2.4	362	39	401
Robbery	118,903	8,989	14.5	3.4	27.2	92	736	828
Burglary	99,621	562	11.3	3.6	30.0	76	636	712
Larceny-Theft	39,366	722	4.5	2.8	29.6	24	251	275
Auto Theft	17,675	401	2.0	3.5	6.8	13	26	39
Driving Under Influence	11,649	0	1.3	100.0	0.0	247	0	247
Liquor Laws	0	0	0.0	100.0	0.0	0	0	0
Public Drunkenness	0	0	0.0	100.0	0.0	0	0	0
Stolen Property	11,248	642	1.3	0.0	15.1	0	38	38
Prostitution	0	0	0.0	0.0	12.8	0	0	0
Drug Laws	171,124	46,470	24.6	0.0	100.0	0	4,605	4,605
TOTAL	**803,397**	**80,259**	**100**	**NA**	**NA**	**1,790**	**6,693**	**8,483**

SOURCES: U.S. Department of Justice (1992b), table 2, p. 3; (1994b), table 6.46, p. 615.

NOTE: Components may not sum to totals because of rounding. Total number of State and Federal prisoners equals 883,656. Total SCC was $16.6 billion in 1990; inflation of 13 percent increased this value to $18.7 billion in 1992. No State and Federal prisoners were incarcerated for alcohol-related offenses of driving under the influence, liquor laws, or public drunkenness.

Table C.4

Publicly Financed Criminal Justice System, Local Correction Costs by Type of Offense, 1992

	Arrests		Causal Factors (%)		Local Correction Costs[1] (millions of dollars)		
Type of Offense	**Number**	**Percent of Total**	**Alcohol Abuse**	**Drug Abuse**	**Alcohol**	**Drug**	**Total Alcohol and Drug**
Homicide	22,510	0.2	30.0	15.8	4	2	7
Aggravated Assault	507,210	3.6	30.0	5.1	99	17	116
Sexual Assault	39,100	0.3	22.5	2.4	6	1	6
Other Assaults	1,074,700	7.6	30.0	5.1	211	36	247
Robbery	173,310	1.2	3.4	27.2	4	31	35
Burglary	424,000	3.0	3.6	30.0	10	83	93
Larceny-Theft	1,504,500	10.7	2.8	29.6	28	291	319
Auto Theft	197,600	1.4	3.5	6.8	5	9	13
Driving Under Influence	1,624,500	11.5	100.0	0.0	1,062	0	1,062
Liquor Laws	541,700	3.8	100.0	0.0	354	0	354
Public Drunkenness	832,300	5.9	100.0	0.0	544	0	544
Stolen Property	161,500	1.1	0.0	15.1	0	16	16
Prostitution	96,200	0.7	0.0	12.8	0	8	8
Drug Laws	1,066,400	7.6	0.0	100.0	0	697	697
Other	5,809,570	41.3	0.0	0.0	0	0	0
TOTAL	**14,075,100**	**100.0**	**NA**	**NA**	**2,326**	**1,191**	**3,517**

SOURCES: U.S. Department of Justice (1992b), table 2, p. 3; (1994b), table 30, p. 218.

NOTE: Components may not sum to totals because of rounding.

[1] Total Local Correction Costs equals $8.14 billion in 1990; adjusted up 13 percent for inflation in 1992 equals $9.2 billion.

Table C.5

Federal Funds for Reducing the Supply of Drugs, 1985 and 1993

Federal Agency	1985 Amount (millions of dollars)	Percent Distribution	1993 Amount (millions of dollars)	Percent Distribution
Justice	*436.2*	*31.6*	*1,162.5*	*31.5*
Drug Enforcement Administration	331.7	24.0	756.6	20.5
Interpol	0.1	0.0	1.9	0.1
Immigration and Naturalization Service	0.5	0.0	147.0	4.0
Federal Bureau of Investigation	103.9	7.5	257.0	7.0
Treasury	*326.8*	*23.7*	*803.8*	*21.8*
Customs	255.9	18.5	561.0	15.2
Internal Revenue Service	61.6	4.5	91.8	2.5
Bureau of Alcohol, Tobacco and Firearms	9.3	0.7	151.0	4.1
Transportation	*508.7*	*36.9*	*331.5*	*9.0*
U.S. Coast Guard	508.2	36.8	310.5	8.4
Federal Aviation Administration	0.5	0.0	21.0	0.6
State	*56.8*	*4.1*	*296.9*	*8.0*
International Narcotics Matters	51.6	3.7	147.8	4.0
Agency for International Development	4.2	0.3	139.8	3.8
U.S. Information Agency	1.0	0.1	9.3	0.3
Agriculture	*4.4*	*0.3*	*16.1*	*0.4*
Agricultural Research Service	1.4	0.1	6.5	0.2
U.S. Forest Service	3.0	0.2	9.6	0.3
Interior	*3.4*	*0.2*	*39.1*	*1.1*
Bureau of Land Management	0.2	0.0	10.0	0.3
U.S. Park Service	0.8	0.1	8.7	0.2
Bureau of Indian Affairs	2.0	0.1	19.4	0.5
Fish & Wildlife Service	0.4	0.0	1.0	0.0
Defense	*44.0*	*3.2*	*1,040.6*	*28.2*
TOTAL	**$1,380.3**	**100.0**	**$3,690.5**	**100.0**

SOURCE: Office of National Drug Control Policy (1994).

NOTE: Components may not sum to totals because of rounding.

Table C.6

Medical Costs for Victims of Violent Crime Due to Alcohol and Other Drugs, 1992

Type of Crime	Number of Victimizations	Causal Factor (%) Alcohol Abuse	Causal Factor (%) Drug Abuse	Medical Expenses per Victim ($)	Total Attributed to Alcohol or Drugs (millions of dollars) Alcohol Abuse	Total Attributed to Alcohol or Drugs (millions of dollars) Drug Abuse
Assault	5,254,690	30.0	5.1	210*	331	56
Rape	140,930	22.5	2.4	28*	1	.09
Robbery	1,225,510	3.4	27.2	4*	2	14
Homicide	23,760	30.0	15.8	9,258**	66	35
TOTAL	**6,644,890**	NA	NA	NA	**400**	**105**

SOURCE: U.S. Department of Justice (1994b), table 4, p. 60; (1993b,c).

NOTE: Components may not sum to totals because of rounding.

*Costs inflated from 1991 NCVS data. These are short-term costs only.

**Costs inflated from Miller et al. (1993) and include long-term costs.

Table C.7

Property Damage Costs to Victims of Crime by Type of Crime, 1992

Type of Crime	Property Damage Crimes Number (thousands)	Property Damage Crimes Cost (millions of dollars)	Causal Factor (%) Alcohol Abuse	Causal Factor (%) Drug Abuse	Amount Attributed to Alcohol and Drug Abuse (millions of dollars) Alcohol Abuse	Amount Attributed to Alcohol and Drug Abuse (millions of dollars) Drug Abuse
Robbery	1,226	20.7	3.4	27.2	0.7	5.6
Assault	141	4.1	30	5.1	1.2	0.2
Personal Larceny	12,211	280.0	2.8	29.6	7.8	82.9
Burglary	4,757	175.4	3.6	30.0	6.3	52.6
Household Larceny	8,101	114.7	2.8	29.6	3.2	34.0
Motor Vehicle Theft	1,959	256.1	3.5	6.8	9.0	17.4
TOTAL	**28,395**	**851.0**	NA	NA	**28.3**	**192.7**

SOURCE: U.S. Department of Justice (1994a), p. 2.

NOTE: Components may not sum to totals because of rounding.

APPENDIX D. SUPPLEMENTAL TABLES FOR SOCIAL WELFARE COSTS

Table D.1

Social Welfare Expenditures in the U.S., 1992

(billions of dollars)

Program	Total Recipients (millions[1])	Total Expenditures	Transfer Payments	Administrative and Direct Service Costs
SOCIAL INSURANCE PROGRAMS				
Disability Insurance (OASDI)	3.5[2]	32.0	31.17	.83
Unemployment Insurance	3.2[3]	39.5	35.99	3.51
Railroad Temporary Disability Insurance	.008[4]	.0403	.0263	.014
State Temporary Disability Insurance		3.22	3.08	.14
Veterans Pensions and Compensations	2.67[5]	17.30	16.38	.92
Workers Compensation	n/a	37.36	35.38	1.98
Total, Social Insurance		**126.2**	**119.0**	**7.19**
PUBLIC AID				
Cash Aid Programs				
Supplemental Security Income (SSI)	4.02[6]	22.20	20.66	1.54
Aid to Families with Dependent Children (AFDC)	4.77[7]	22.20	20.83	1.37
Public Assistance	n/a	132.74	124.11	8.63
Low Income Heat and Energy Assistance Program	6.2[8]	2.23	2.09	.14
Total, Cash Aid Programs		**179.37**		
Non-Cash Aid Programs				
Food Stamps	25.4[9]	16.25	15.29	.96
Woman, Infants and Children (WIC)	1.22[10]	2.57	2.42	.15
Public Housing	4.48[11]	12.5 (1993)	11.76	.74
Total, Non-Cash Programs		**31.32**		
Total, Public Aid		**210.69**	**197.21**	**13.48**
DIRECT HUMAN SERVICES				
Child Welfare				
Title IV-B	NA	.27	.18	.09
Title IV-E (Foster Care)	.222[12]	2.21	1.19	1.02
Title IV-E (Adoption Assistance)	.066[13]	.22	.16	.06
Head Start	.621[14]	2.23	0	2.23
Vocational Rehabilitation	.950[15]	2.13	0	2.13
Special Education	4.3	2.63	0	2.63
Total, Direct Human Services		**9.66**	**1.52**	**8.14**
Total for Programs Analyzed in This Study		**336.89**	**317.73**	**19.19**

SOURCES: U.S. Bureau of the Census (1994); Committee on Ways and Means (1994); U.S. Dept. of Health and Human Services (1993a).

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[1] Recipient and expenditure data from 1992 unless otherwise noted.
[2] Monthly average December 1992.
[3] Average weekly 1992.
[4] Weekly average for 1990.
[5] As of September 30, 1992.
[6] Monthly average number disabled, December 1992.
[7] Average monthly, head of household.
[8] Households for FY 1992.
[9] Average annual for FY 1992.
[10] Heads of household.
[11] Households in March 1993 receiving means-tested benefits.
[12] Average monthly.
[13] Average monthly.
[14] Average annual, 1992.
[15] Includes active cases accepted for rehab. services during year, plus active cases on hand at beginning of 1992.

Table D.2

A Summary of Studies on Social Welfare and Substance Abuse

Study	Welfare Program	Measure	Value
Substance Abuse and Women on Welfare *	Aid to Families with Dependent Children (AFDC)	Alcohol abuse is defined as drinking five or more drinks in one sitting, two or more times a month. Drug use is defined as having used illicit drugs in the past year.	1.3 million (28 percent) AFDC recipients abuse or are addicted to drugs and alcohol. Alcohol: 12 percent met abuse criteria in last month. Drugs: 23 percent used illicit drugs in last year.
Patterns of Substance Use and Program Participation **	AFDC; Food Stamps	Alcohol: five or more drinks three or more times in the past 30 days; Drugs: past month or past year use	Alcohol: AFDC—8.7 percent; Food Stamps—10.4 percent; Drugs: Past month—AFDC—10.5 percent, Food Stamps—10.1 percent; Past year—AFDC—21.6 Food Stamps—19.5
Patterns of Substance Use and Substance-Related Impairment Among Participants in the AFDC Program **	AFDC	"Significant impairment" would include dependency on alcohol and drunk at least weekly or dependent on an illicit drug other than marijuana and used an illicit drug at least monthly or heroin once in the last year.	4.9 percent of female AFDC recipients are estimated to have significant functional impairment related to substance abuse.
Alcohol and Drug Problems among Diverse Health and Social Service Populations ***	Representative sample of welfare recipients (mostly in AFDC and General Assistance) in a No. California County	Problem drinking is defined as meeting two of the three following criteria: drinking five or more drinks on an occasion at least once per month; demonstrating one or more dependency symptoms; or experiencing one or more social consequences. Drug use measures unprescribed use during past year.	Problem Drinkers: 24 percent Illicit Drug user: 58 percent Multiple Drug User: 21 percent
Social Security: Major Changes Needed for Disability Benefits for Addicts ****	Disability Insurance; Supplemental Security Income	Addiction is defined as medical evidence consisting of symptoms, signs, and laboratory findings that determine that beneficiary cannot work and whose physical or mental impairment is expected to last for at least 12 months or result in death.	4.8 percent of the adult SSI population are diagnosed with addiction, of which 2.6 percent of the Drug Addict & Alcoholic (DA&A) recipients; 2.8 percent of the DI population are diagnosed with addiction. No breakdown of cases by alcoholic or drug addict is provided.
SSI Payments to Drug Addicts and Alcoholics: Continued Dependence *****	Supplemental Security Income	Addiction is defined as medical evidence consisting of symptoms, signs, and laboratory findings that determine that beneficiary cannot work and whose physical or mental impairment is expected to last for at least 12 months or result in death.	80,332 (2.0 percent) DA&A cases in the SSI program are diagnosed with addiction. This number does not include primary and secondary diagnoses that are not in DA&A. For those with a primary diagnosis, 67 percent of cases are alcoholics and 33 percent are drug addicts.

*Center on Addiction and Substance Abuse (1994).
**U.S. Department of Health and Human Services (DHHS; 1994b).
***Weisner and Schmidt (1993).
****United States General Accounting Office (1994).
*****DHHS (1994d).

Table D.3

Alcohol- and Drug-Related Social Welfare Expenditures, 1992
(billions of dollars)

Program	Total Expenditures[1]	Total Admin. and Direct Service Costs[2]	Percent Attributed to AOD[3]	Benefit Costs Attributed to Alcohol and Drugs			Administrative and Direct Service Costs Attributed to Alcohol and Drugs		
				Total	Alcohol (67%)[4]	Drugs (33%)	Total	Alcohol (67%)	Drug (33%)
SOCIAL INSURANCE PROGRAMS									
Disability Insurance (OASDI)	32.00	.83 (2.6%)	1.7	.53	.35	.18	.0140	.0095	.0045
Unemployment Insurance	39.5	3.51 (8.9%)	1.7	.61	.41	.20	.0597	.0400	.0197
Railroad Temporary Disability Insurance	.0403	.014 (35%)	1.7	.0045	.0030	.0015	.00024	.00016	.0000
State Temporary Disability Insurance	3.22	.14 (4.3%)	1.7	.052	.035	.017	.0024	.0016	.0008
Veterans Pensions and Compen-sations	17.30	.92 (5.3%)	1.7	.28	.19	.09	.0156	.0104	.0052
Workers Compensation	37.36	1.98 (5.3%)	1.7	.60	.40	.20	.0377	.0226	.0111
Total, Social Insurance Programs	**126.20**	**7.394**	**1.7**	**2.077**	**1.388**	**.689**	**.130**	**.084**	**.041**
PUBLIC AID									
Cash Benefits									
Aid to Families with Dependent Children (AFDC)	22.2	1.37 (6.2%)	5.2	1.08	.73	.35	.1189	.0477	.0235
Supplemental Security Income	22.2	1.54 (6.9%)	3.0	.62	.42	.20	.0462	.0310	.0152
Public Assistance	132.74	8.63 (6.5%)	4.1	5.09	3.41	1.68	.3538	.2371	.1167
Low Income Heat and Energy Assistance Program	2.23	.16 (6.5%)	4.1	.085	.057	.028	.0062	.0041	.0021
Non-Cash Benefits									
Food Stamps	16.25	.96 (5.9%)	5.2	.79	.53	.26	.0499	.0334	.0165
Woman, Infants and Children (WIC)	2.57	.15 (5.9%)	4.1	.099	.066	.033	.0062	.0041	.0021
Public Housing	12.5 (93)	.74 (5.9%)	4.1	.48	.32	.16	.0303	.0203	.0100
Total, Public Aid	**179.37**	**13.54**	**4.1**	**8.244**	**5.533**	**2.711**	**.6115**	**.3777**	**.186**

Table D.3 (Cont'd)

Alcohol- and Drug-Related Social Welfare Expenditures, 1992

(billions of dollars)

Program	Total Expenditures[1]	Total Admin. and Direct Service Costs[2]	Percent Attributed to AOD[3]	Benefit Costs Attributed to Alcohol and Drugs			Administrative and Direct Service Costs Attributed to Alcohol and Drugs		
				Total	Alcohol (67%)[4]	Drugs (33%)	Total	Alcohol (67%)	Drug (33%)
DIRECT HUMAN SERVICES									
Child Welfare									
Title IV-B	.274	.099(36%)	3.3	.0072	.0048	.0024	.0041	.0027	.0014
Title IV-E (Foster Care)	2.21	1.02 (46%)	3.3	.0488	.0327	.0161	.0418	.0280	.0138
Title IV-E (Adoption Assist.)	.22	.058 (26%)	3.3	.0066	.0044	.0022	.0024	.0016	.0008
Head Start	2.23	2.23 (100%)	3.3	0	0	0	.0736	0.493	.0243
Vocational Rehabilitation	2.13	2.13 (100%)	3.3	0	0	0	.0703	.0471	.0232
Special Education	2.63	2.63 (100%)	3.3	0	0	0	.0868	.0581	.0287
Total, Direct Human Services	9.66	8.167		**.063**	**.042**	**.021**	**0.279**	**.187**	**.092**
TOTAL	**346.55**	**29.101**		**10.383**	**6.963**	**3.420**	**1.020**	**.649**	**.320**

[1] All data are from 1992 unless otherwise noted.

[2] Head Start, Vocational Rehabilitation, and Special Education programs make no transfer payments.

[3] Percentages are calculated using available data sources (e.g., data from the DI program are applied to other social insurance programs). Data from AFDC and SSI are averaged and applied to public aid programs; averages of all available data sources are applied to direct human service programs.

[4] The breakdown between alcohol and drug users is based on administrative records kept by the SSI program. The breakdown is based on a primary diagnosis of either alcohol or drug dependence.

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